AY, 1949

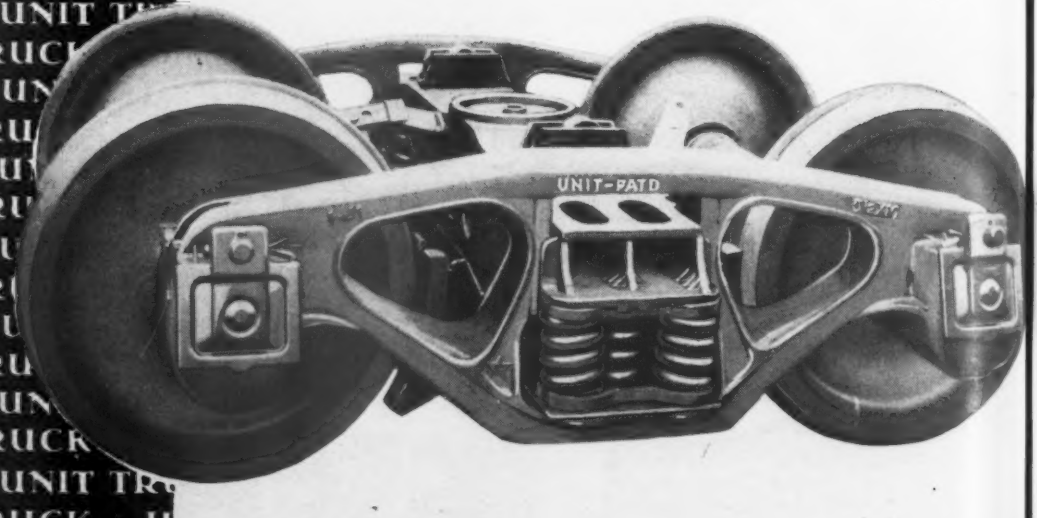
Transportation Library

RAILWAY MECHANICAL ENGINEER

MAY 10 1949

UNIT TRUCK

was specified for 60.7%
of the freight cars ordered
for domestic service in 1948



UNIT TRUCK CORPORATION NEW YORK

MAY, 1949

RAILWAY MECHANICAL ENGINEER

With which is incorporated the Railway Electrical Engineer. Founded in 1832 as the American Rail-Road Journal.

VOLUME 123 NO. 5

FEATURE SECTION:

Six Trains for Joint California Service 241
E-M.D. Diesel Road Locomotives 247
Diesel Maintenance on the Central of Georgia 251
Flame Shape Cutting in Railroad Shop Operations 253

EDITORIALS

What About Your Management? 256
Improved Reefers Reduce Banana Losses 256
Modern Management Facilities Pay Dividends 257
Electric Locomotives 258
Technological Limitations 258

SHOPS AND TERMINALS:

Power-Operated Superheater-Unit Truck 259
Press Attachment for Removing Diesel Wheels 259
Milling Trailer and Engine Truck Rockers 260
Gas Firing Makes Saving of $3.03 260
Safety Ladder 261
Machining Radial Buffers 261
Adjusting Travelgraph Torches 262

QUESTIONS AND ANSWERS:

Diesel-Electric Locomotive 263
Steam Locomotive Practice 264
Steam Locomotive Boilers 265
Schedule 24RL Air Brakes 266

CAR INSPECTION AND REPAIR:

Dolly for Applying Air Brake Equipment 267
Straightening Car Sides and Ends 267
Changes in the 1949 Interchange Rules 268
Device for Magnaflux Testing of Couplers 271
A.W.S. Forum on Welding Practices 271

ELECTRICAL SECTION:

Battery Avoids High Power Load Peak 273
Virginian Electrics Meet Performance Requirements ... 274
Consulting Department 281

NEW DEVICES:

Most Powerful High-Speed Diesel Engine 282
Disconnecting Lowering Hangers 282
Bonnet Sealing Diaphragm Valve 283
Welding of Wheel Centers 283
Paint and Varnish Remover 283
Safety Step Edge 284
Diesel Plant for Caboose Power 284
Hand-Operated Degreaser 284
Three-Phase Transformers 284
Lightweight Welding Helmet 285
Floating Battery Charges 285
Triple Valve Assembly Kit 285
Carbon Steel Adjustable Wrenches 285
Compound-Bore Journal Bearing 286
Rod Clamp for Gravity Drop Hammer 286
Rectifiers for Charging Truck Batteries 286
Vertical Sander 286

NEWS 287

INDEX TO ADVERTISERS 53

C. B. Peck,
Editor, New York

H. C. Wilcox,
Managing Editor, New York

E. L. Woodward,
Western Editor, Chicago

A. G. Oehler,
Electrical Editor, New York

C. L. Combes,
Associate Editor, New York

G. J. Weihofen,
Associate Editor, Chicago

C. W. Merriken, Jr.
Business Manager, New York

Published monthly by Simmons-Boardman Publishing Corporation
1309 Noble street, Philadelphia, Pa. Editorial and executive offices: 30 Church street, New York 7, and 105 West Adams street, Chicago 3. Branch offices: Terminal Tower, Cleveland 13; 1081 National Press bldg., Washington 4, D. C.; 1038 Henry bldg., Seattle 1, Wash.; 300 Montgomery street, Room 805-806, San Francisco 4, Calif.; 530 W. Sixth street, Los Angeles 14, Calif.; 2909 Maple avenue, Dallas 4, Tex.

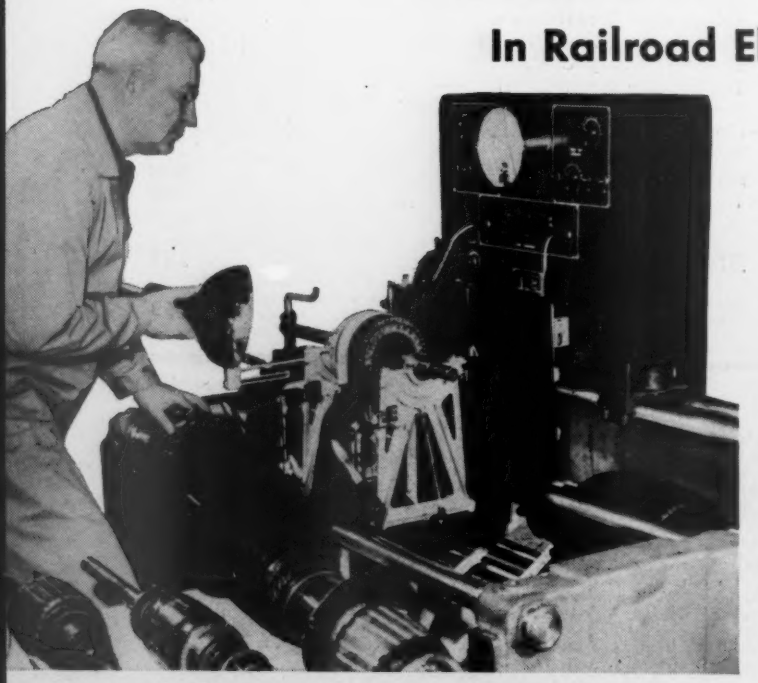
Samuel O. Dunn, Chairman, Chicago; *James G. Lyne*, President, New York; *S. Wayne Hickey*, Vice-Pres., New York; *C. Miles Burpee*, Vice-Pres., New York; *H. H. Melville*, Vice-Pres., Cleveland; *C. W. Merriken*, Vice-Pres., New York; *F. C. Koch*, Vice-Pres., New York; *Robert E. Thayer*, Vice-Pres., New York; *H. E. McCandless*, Vice-Pres., New York; *John R. Thompson*, Sales Mgr., Western District, Chicago; *J. S. Crane*, Sec., New York; *J. T. DeMott*, Treas., New York; *Ralph E. Westerman*, Asst. Treas., Chicago; *Arthur J. McGinnis*, Asst. Treas., New York.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A.B.P.) and the Audit Bureau of Circulations (A.B.C.) and is indexed by the Industrial Arts Index and also by the Engineering Index Service. Printed in U. S. A.

Subscriptions payable in advance and postage free, United States, U. S. Possessions and Canada, 1 year, $3; 2 years, $5. Other countries in Western Hemisphere: 1 year, $5; 2 years, $8. All other countries; 1 year, $7; 2 years, $12. Single copies 50 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York 7.

VIBRATION COSTS TOO MUCH!

In Railroad Electrical Equipment—*of All Places!*



After repairing or rebuilding, accurate balance is quickly and accurately restored on parts like these. The DYNETRIC 3-S Balancing Machine shown here handles numerous sizes and types of motors and generators used on Pullman, coach and locomotive equipment.

DYNETRIC BALANCERS — GISHOLT — DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION. "DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

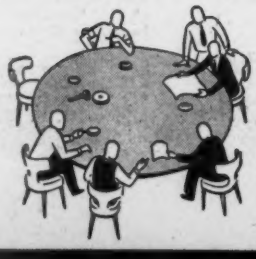
Vibration is bad enough even when you find it in stationary-mounted equipment. But pity this generator which takes incessant pounding along the right-of-way.

No wonder leading railroads have turned to Gisholt DYNETRIC Balancers to cut their costs. And they've found their answer in maintenance records which show that bearing life is from eight to twelve times longer when rotating parts are properly balanced on Gisholt DYNETRIC Balancing Machines.

Gisholt offers you years of leadership in perfecting the finest in balancing equipment, plus years of experience in working closely with railroad maintenance shops. We can help you cut costs as we have helped others.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin



THE GISHOLT ROUND TABLE represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

RAILWAY
MECHANICAL
ENGINEER

Six Trains for Joint California Service

Sixty-six Budd-built cars purchased by C. B. & Q., D. & R. G. W. and W. P.—Vista Domes on coaches, lounge and observation cars

A DAILY passenger-train service was inaugurated on March 20 between Chicago and San Francisco, Calif., jointly by the Chicago, Burlington & Quincy, the Denver & Rio Grande Western, and the Western Pacific. The six sets of rolling stock by which this "California Zephyr" service is protected are of lightweight stainless-steel construction, built by the Budd Company, Philadelphia, Pa. A daily New York-San Francisco through car which operates via the Pennsylvania and the New York Central on alternate days. The train makes its 2,532-mile run, including ferry between Oakland Pier and San Francisco, in 50 hr. 30 min., eastbound, and 51 hr. 20 min., westbound. The route includes 1,034 miles over the Burlington, 570 miles over the Rio Grande, and 928 miles over the Western Pacific.

The Vista-Dome room-buffet-observation car

Each train consists, in the following order of a baggage car, three Vista Dome coaches, a Vista Dome buffet-lounge car, two six-bedroom-and-10-roomette cars, a dining car one 16-section sleeper, one six-bedroom-and-10-roomette car, and a Vista Dome lounge-observation car with one drawing room and three bedrooms. The accommodations include 138 regular coach seats and 72 dome seats in the three coaches. There are 19 buffet and seven lounge seats in the buffet-lounge car for coach passengers. Sleeping-car berth space is available for 107 passengers. The Vista Dome observation car has seats for 12 in the buffet and 14 in the observation lounge. There are 24 seats in the Vista Dome. The Vista Dome seats in the buffet-lounge car are also for sleeping-car passengers only.

The cars are 85 ft. long, coupled, except the baggage car, which is 72 ft. 8 in., coupled. The exteriors are unpainted, except for the lettering which consists of the name of the train on the middle of the letterboard, the initials of the owning road in smaller letters at each end of the letterboard, and the name of the car in the middle of the side below the windows. Each coach, sleeper and observation car has one vestibule. The buffet-lounge and dining cars are without vestibules.

The Vista-Dome Coaches

Each Vista-Dome coach has two passenger sections at the car-floor level. The forward section, as the cars normally run, seats 18 passengers, and the one at the rear, 28 passenger. The stairway to the dome leads from the 28-passenger section.

The coach seats are fully adjustable, separately reclining for each passenger and equipped with heavily

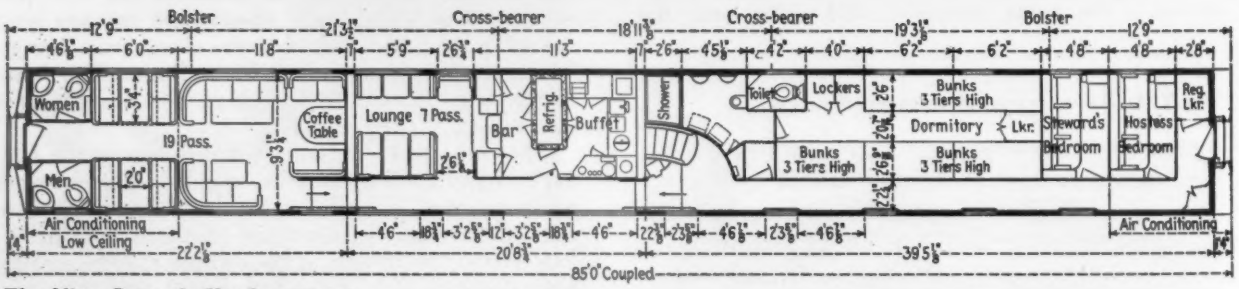
padded leg rests. When not in use, these may be folded under the seat. They make no contact with the seat in front. A standard adjustable foot rest is provided for daytime use. The seats in the domes are not adjustable, but have adjustable foot rests.

To the right at the rear of the forward passenger section of the coaches is the under-dome passageway leading to the other end of the car. Opening off this are the women's and men's dressing rooms. In the passageway of the forward coach in each train is a swinging door dividing from the rest of the coach the section reserved for women and children.

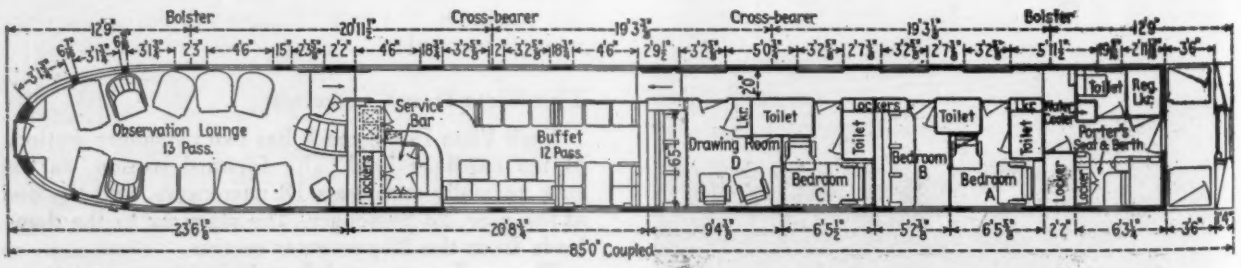
The second coach in each train differs from the others in using a 3½-ft. space in the vestibule end of the car as a conductor's booth. This space, which is used for luggage shelves in the other two cars, is fitted with a seat, a shelf desk and a locker. Across from the booth are the regulator and control lockers.

Vista-Dome Buffet-Lounge

The buffet-lounge car is placed immediately behind the coaches, with the buffet end forward. Opening



The Vista-Dome buffet-lounge car



Vista-Dome room-buffet-observation car

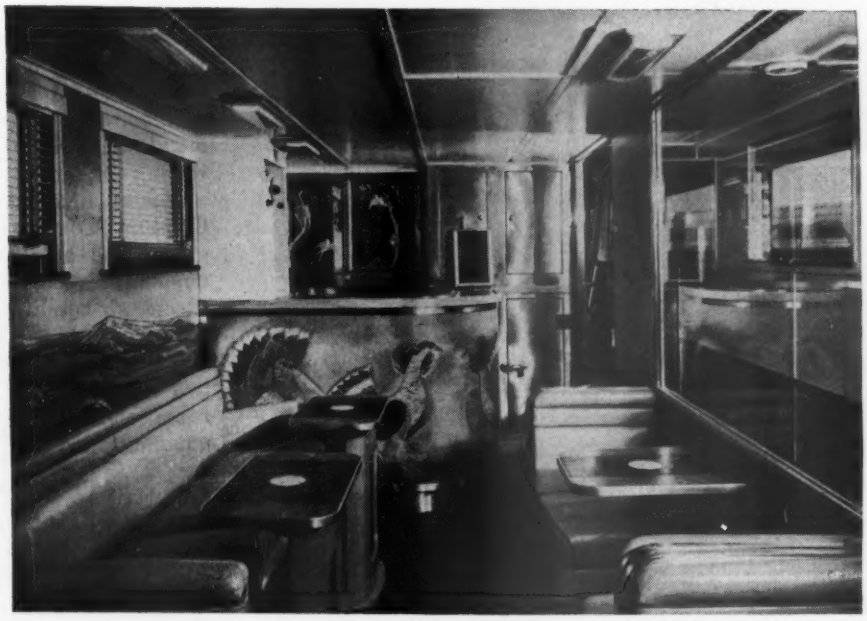
from the under-dome passageway, immediately behind the buffet, is a small lounge and bar. Immediately beyond the bar is a buffet kitchen. From this kitchen sandwiches, coffee and other beverages are served.

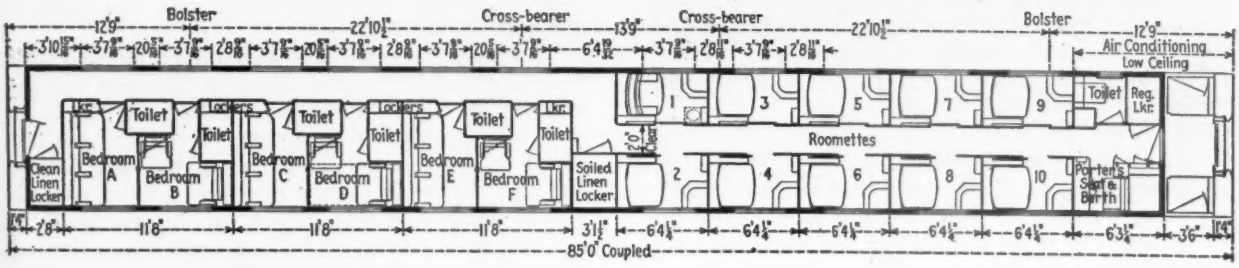
In the passageway, back of the entrance to the lounge, is a low swinging door dividing the train between coach and sleeping-car passengers. Beyond the rear of the passageway is the stairway to the dome, which is reserved for sleeping-car passengers only. The remainder of the car is given over to crew quarters.

At the rear end of the buffet-lounge car there are two bedrooms, one of which, for the steward, with both upper and lower berths. The other bedroom for use of the hostess, has only a lower berth.

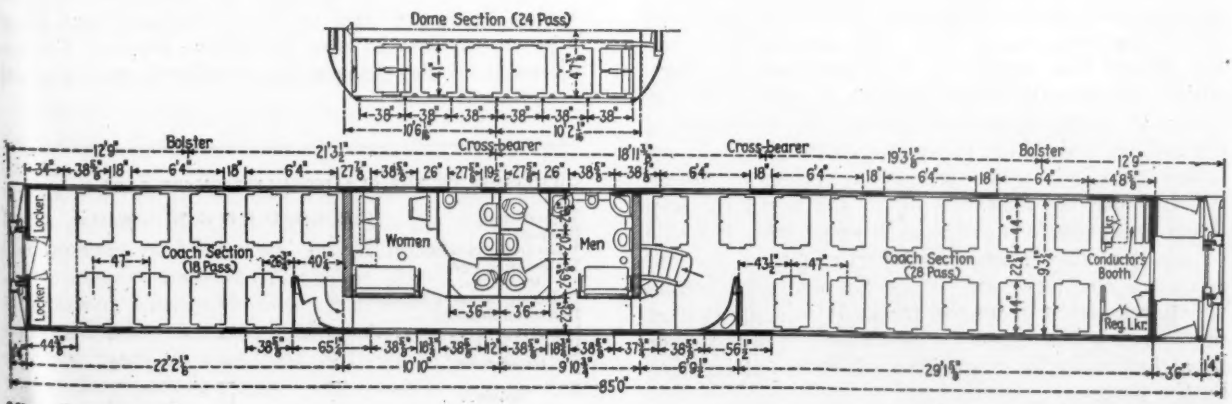
Right:—Under dome buffet in the Vista-Dome roof-buffet-observation car

Left: The dining car. The steward's desk is in the background.





Six-bedroom and 10-roomette sleeping car



Vista-Dome coach

Entrance to the Vista Dome from the observation lounge

Sleeping Cars

There are four sleeping cars in each train, three 10-roomette and 6-bedroom cars and one 16-section car. There are also three bedrooms and a drawing room in the lounge-observation car.

At the vestibule end of each room car, are a toilet room and the electrical regulator and control lockers on one side and the porter's area and bedding locker across the aisle. The porter's area includes a locker, a seat, and a high folding berth which is screened from the aisle by a curtain when made up.

Adjoining the porter's area are 10 roomettes, each occupying a longitudinal space of 6 ft. 4¼ in. By reducing the width of the berth about 5 in. for a length of 18 in. from the foot, placing the toilet at the outside corner of the room and the wash basin adjoining the aisle partition, there is ample space for the occupant to stand inside the room while lowering the berth from its daytime position.

In the rear section of the car are six double bedrooms. Transverse and longitudinal rooms alternate and folding partitions permit them to be joined in pairs to form master bedrooms. In the daytime each transverse room has a sofa with folding arm rests for three. The upper, in the longitudinal room, which occupies the usual position in relation to the lower at night, is stored during the day against the ceiling adjoining the passageway partition. To make it up it is rolled across the ceiling on tracks which cause the leading side of the berth to drop down gradually to position as it approaches the side of the car. The front of the berth is then lowered against a counterweight spring by turning a handle which releases it from the track. It is supported at one end on a bracket on the partition and at the other by a steel rod from the ceiling which is put in place by the porter.

Each room has an enclosed toilet in which is a Combolet (a combination wash basin and folding toilet). All toilet rooms in the train are floored with ceramic tile and the walls covered with a plastic impervious to water. The bedroom cars are piped for later installation of shower heads in the toilet rooms. Drains in the floors are temporarily capped.

The 16-section sleeper has no room accommodations. There are men's and women's dressing rooms, at opposite ends of the car.

Diners

Two seating arrangements have been used on the diners. One of these cars, with tables for four on each side of the aisle in the main dining section, is illustrated. These cars can be altered to provide small tables for two on one side of the aisle, thus reducing the seating capacity from 48 to 40.

The kitchen and pantry equipment, built by Angelo Colonna, is of stainless steel. The fuel is propane gas. Some additional improvement in the kitchen temperature is effected by utilizing in the kitchen excess air-conditioning capacity not needed in the dining room. Electrical facilities in the kitchen include a dish washer, a glass washer, a juicer, and two exhaust fans. The sliding door at the dining-room end of the car is operated by a national pneumatic device.

The Vista-Dome Lounge-Observation Car

In the lounge-observation car are three double bedrooms and a drawing room. The cocktail lounge, seating 12, and an open service bar, are located under the dome.

The observation lounge has two settees facing the rear, four lounge chairs on the corridor side, and five lounge chairs, a writing desk and chair on the opposite side.

The baggage cars have two doors in each side, located about 16 ft. from the ends. Those at one end are double, with 9-ft. openings; those at the other end, single, with 5-ft. openings. Wet racks are provided on each side at each end of the car. Folding baggage shelves, a folding desk and a letter case are placed along one side of the car. In an alcove at one corner is a toilet, a folding wash basin, the regulator locker, and a water cooler.

Interior Decorative Treatment

Eight major color schemes are employed in these trains. There are three in the coaches and each other type of car has its own distinctive scheme. Certain elements of the decorations, however, give a sense

OWNERSHIP OF THE "CALIFORNIA ZEPHYR" CARS

Type of car	C. B. & Q.	D. & R. G. W.	W. P.	Total
Baggage	3	1	2	6
Vista-Dome coaches	7	4	7	18
Vista-Dome buffet-dormitory	3	1	2	6
10 Roomette and 6 bedroom	6	5	7	18
16-section sleepers	2	2	2	6
Diners	3	1	2	6
Vista-Dome buffet-observation	3	1	2	6
Totals	27	15	24	66

SCALE WEIGHTS OF THE "CALIFORNIA ZEPHYR" CARS, LB.

	Light weight	Ready to run	Maximum load
Baggage	103,900	120,500	167,350
Coaches	148,700	154,300	165,700
Buffet-lounge	155,620	163,520	171,620
Open-section sleeper	136,410	143,000	148,300
Diner	148,150	160,300	169,400
Bedroom-roomette	142,350	149,150	152,850
Dome-bedroom-observation	151,030	159,250	168,550

Note: The average weight of trucks per pair is 40,500 lb.

of unity which carries throughout the train. One such feature is the original murals of western subjects, done in oil, in the coaches and buffets, and carved and painted linoleum murals and etched glass in the dining car and the bars of the buffet-lounge and lounge observation cars.

Communications

The trains are equipped with radio and public-address systems. Two two-spool wire reproducers can give twelve hours' continuous entertainment. There is also a telephone system by which members of the train crew may communicate between certain points in the train.

The Western Electric radio system consists of two sets, each having 17 pretuned crystal receivers, thus making available up to 34 broadcasting stations. This equipment is controlled from a master control panel, about 6 ft. by 18 in., adjacent to the steward's desk. The public-address system is operated here from a hand set, a push button which cuts out radio or wire-recorded programs and cuts the public address system in for announcements. There is a similar hand set in the conductor's alcove in the second coach.

In the dome coaches one selector switch determines the program for the entire car. Volume controls are separate, however, for the dome and main floor of the car. All sleeping rooms have individual loud speakers, placed in or near the ceiling for better sound distribution, and an individual five-position selector switch and volume control. The occupant may select the public address so that he may hear announcements and nothing else; he may select a wire-recorded program or either of two radio programs, or he may turn the system off entirely.

Individual radios are installed in the buffet-lounge and the lounge-observation cars. The train phone system communicates between the dining car and the buffet in the observation car.

Lighting and Air Conditioning

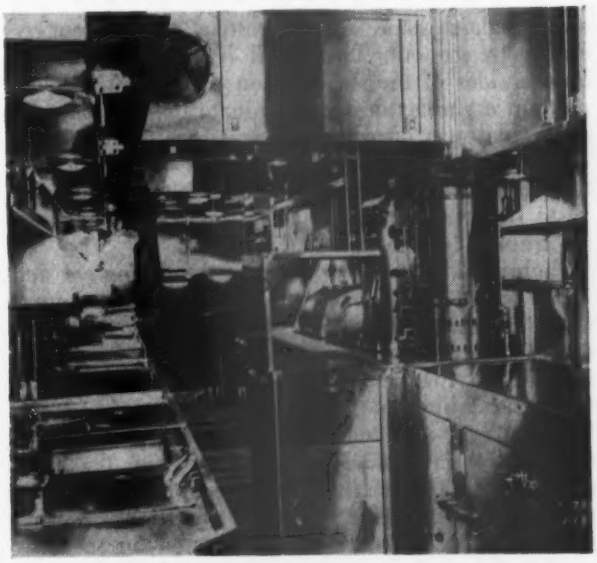
With the exception of the diners, all the passenger cars have 25-kw. Safety genemotors and Spicer drives. For the dining cars the capacity is 30 kw. Except for the dining cars the Exide storage battery has a capacity of 1,294 amp. hr. In the dining cars the capacity is 2,588 amp. hr. Motor alternators of 2-kw. capacity convert 32-volt d.c. power to 110-volt a.c. power. Cars with heavy a.c. electric loads are equipped with two motor alternators which operate on split loads so that one of them is off at night when the load is light. The supply power for fluorescent lighting, razor outlets, vacuum-cleaner outlets, electrostatic air filters, radios and the public-address system. Direct-current power is used for air conditioning, incandescent lighting and for the water coolers.

Fluorescent lighting is installed in all passenger space in these trains, except for the reading lights under the luggage racks in the coaches and a reading light in each roomette, which are incandescent. Incandescent lamps light the toilets, vestibules, passageways, kitchen, crew quarters and porters' areas. The reading lamps under the luggage racks—one for each seat—are individually controlled. Luminator lens fixtures are in general use.

Each ceiling unit in the coaches has a cylindrical magnifying lens formed in the bottom to control the light to the aisle only. This design produces a low level of soft light in the seat area without glare.

As one goes up the stairs to the dome for night observation, lighting gradually changes from a high level to an extremely low level, so that the reflections

Looking into the kitchen from the pantry



In the Vista Dome of one of the coaches

The trucks are equipped with Budd disk brakes

on the glass dome do not restrict the passengers' ability to see out. Two small lights are concealed on the sides of the stairway on each tread. Smaller units of a similar design illuminate the leading edge of the platform on which the seats are located.

A continuous row of lensed glassware, built into the ceiling on each side of the air duct, makes the Vista Dome an outstanding feature of this car when the train is in a terminal.

Lighting in the dining room of the dining car and in the buffet and lounge sections of the buffet-lounge and observation-lounge cars is by continuous rows of lensed glassware. Fluorescent lamps are arranged for both daytime and night use in the bedrooms and for general illumination in the roomettes. Lensed fixtures are also employed in the open-section sleeper, in individual units located in the aisle ceiling opposite each pair of sections. There are incandescent lights for both upper and lower berths.

A Mars oscillating light is mounted on the rear of the observation car in a housing built into the end of the car roof and a Neon sign on the rear door displays the words "California Zephyr" and a picture of the Golden Gate bridge.

The capacity of the Frigidaire electro-mechanical air-conditioning equipment is 10 tons on all passenger-carrying cars, with the exception of the four sleeping cars which have a capacity of 7 tons. On dome cars there are two evaporator units, one of six tons' capacity to cool the two main passenger sections and one of four tons' capacity for the dome and under-dome area. In the dining car about six tons is required to take care of the dining room; the equivalent of the remaining four tons is applied in the kitchen to effect some reduction in kitchen temperature. Electro-Air-Mats and Dorex purifiers are a part of the air-circulating system. Cool air is admitted to the passenger space through Multi-Vent ceiling panels.

Frigidaire electro-mechanical refrigeration is employed throughout the dining car and in the buffets of the buffet-lounge and observation cars. This includes ice-cube production.

Mechanical Equipment

The trucks on all cars in these trains have 6-in. by 11-in. axles, equipped with Timken roller bearings. They are of the General Steel Casting equalizer type and the castings are alloy steel. Coil bolster springs and Houde vertical shock absorbers are applied.

The 36-in. rolled-steel wheels are machine balanced. Rubber pads are placed under the center plates, under the equalizers over the journal boxes, and at the ends of the bolsters.

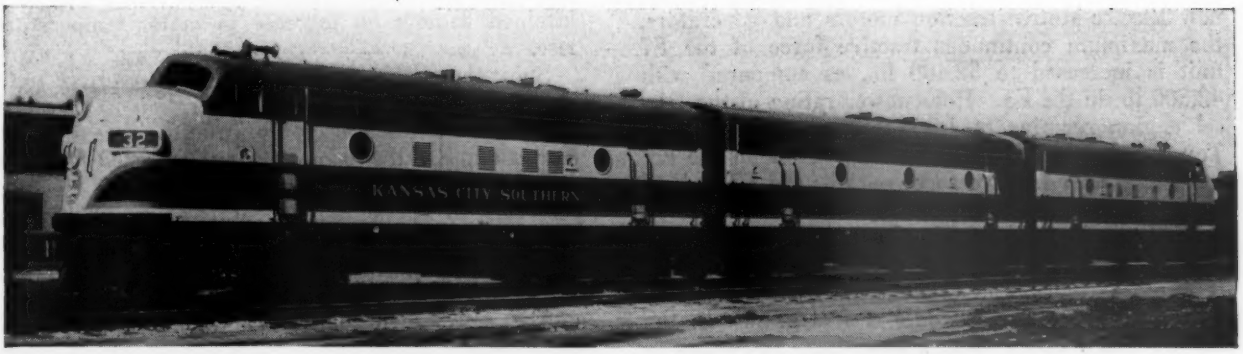
The trucks have Budd disk brakes. The air brakes are Westinghouse HSC type with the American Brake Shoe anti-wheel-slide device. A national lever-type hand brake operates through the disk brake on one pair of wheels only.

The cars are heated by the Vapor Zone Control system, and Vapor water heaters with Westinghouse water-raising system serve the lavatories. National Aluminate water softeners are installed on all cars, except for the drinking water. The Lundy circulating water-cooling system serves all bedrooms. Each car has 500 gal. of underbody water-tank capacity. The diners have an additional 100 gal. capacity in the kitchen which is connected to the water heater.

All brake, steam and water pipes on the car bodies are copper tubing with Walseal fittings. The brake piping on the trucks is extra heavy wrought iron. The propane piping on the dining cars is brass with threaded fittings.

The couplers are National tight lock and the draft gears, Waughmat.

One of the Vista-Dome buffet-lounge cars



E-M.D. Diesel Road Locomotives

Models include F7 and FP7A for freight or heavy passenger service, and E8 for high-speed streamline trains

THREE new main-line Diesel locomotives, designed to increase the tonnage per train, or speed up schedules of present-length trains, have just been announced by the Electro-Motive Division, General Motors Corporation, La Grange, Ill. The new F7 and FP7A models for freight, or heavy-duty passenger service, supplant the F3 general-purpose locomotive brought out in 1946 and the new E8 model succeeds the E7 high-speed passenger locomotive which, with its predecessors, power more than 150 of the nation's famous-name trains.

All three of the new models embody increases in train-heating capacity; extend the life between major overhauls; permit the use of cheaper grades of fuel oil; and make possible faster and more economical maintenance. Tractive force is increased as much as 25 per cent for all types of terrain over that of the locomotives they supersede, permitting railroads to make further reductions in helper service over heavy grades and increase tonnage on level routes.

Dynamic brakes are made available in the new high-speed passenger locomotives and the automatic transition, successfully used in high-speed passenger locomotives, is made basic equipment in the new freight power. Faster passenger-train schedules are made possible by increased water capacity for train heating, thus lengthening the mileage between necessary water stops.

The new locomotives have been designed so that old F units now in railway service can be operated with the new F7 and FP7A units and old E units can be operated with the new E8 units. This permits interchangeable use and protects railroad investment in older E-M locomotives.

New traction motors and generators, developed by Electro-Motive, utilize new silicon insulating materials and new methods of application of insulation. This construction, plus improved cooling, permits higher load factors which are translated into greater tractive force. The new motors and generators are designed to have considerably longer life between major overhauls than the present electric transmission equipment.

A new injector, perfected for E-M Diesel engines, broadens the range of fuels which may be successfully used. Heretofore, fuel of at least 55 cetane rating was required. The new General Motors injector makes it possible to use cheaper fuels of as low as 40 cetane rating. An important by-product of the new injector is the reduction of peak shock cylinder loads for all qualities of permissible fuel, with resultant longer engine life.

Features of the New F7

The F7 locomotive retains the same weight, length and height dimensions as the F3, plus the wide range of tractive force-speed characteristics made possible by the eight optional gear ratios and variations in number of units that can be coupled or uncoupled to fit the locomotive capacity to the size of the train. This range is broadened by the increase in tractive force of the F7.

Because of the increased current capacity of the new Electro-Motive traction motors and generators, the maximum continuous tractive force of the F7 unit is increased to 52,400 lb., as compared with 42,500 lb. in the F3. Horsepower rating of the Diesel engine remains at 1,500 for propulsion alone. Top speed remains 102 miles an hour as in the F3, but the greater tractive force permits the F7 to haul heavier tonnages.

The new F7 will haul 25 per cent more tonnage up a one per cent grade at continuous rating and 30 per cent more tonnage at short time ratings for two hours. Since there are only a few grades in the United States which require more than two hours to climb with the heaviest train permissible with present drawbars, the effect of this is that most railroads will be able to increase tonnage 30 per cent with the new units.

The capacity of the electric retarding, or dynamic, brakes of the F7 has been increased from 540 to 600 amp., so that the increased tonnage can be safely controlled. This increase in dynamic braking capacity is important in that it will enable the railroads to decrease further the use of air brakes with additional savings in brake shoes, wheels and air-brake equipment.

Motor Changes

Increased traction-motor capacity and expected longer life are attained by:

1. The use of inorganic insulation in both armature and field coil, which provides improved thermal conductivity, is unaffected by heat within the operating range and is not subject to shrinkage or burning.
2. Increased traction-motor cooling-fan capacity and more effective motor ventilation.
3. Substitution of brazed connections for bolted and soldered connections in the stator.
4. Heavier power cable in traction-motor and in locomotive wiring.

With these improvements throughout the power transmission system, traction-motor ratings have been increased from a continuous rating of 700 amp. for the F3 to 825 amp. This increased rating has been attained without an increase in motor temperature rise.

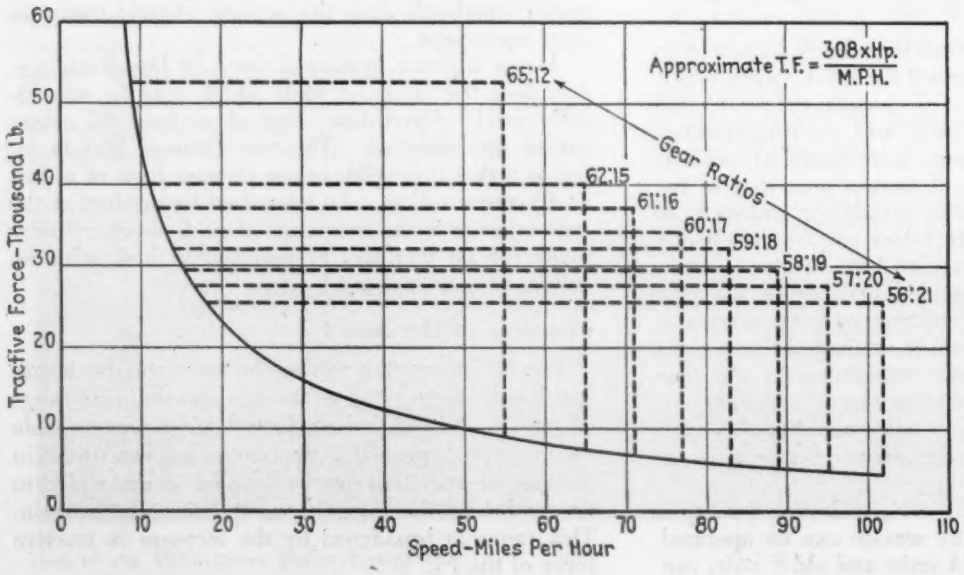
Short-time ratings of the earlier motors were indicated in miles and short-time operation in overload was limited to the mileage shown in the area selected. For example, if the locomotive was operated for eight miles at the eight-mile rating, it was then necessary to return to the continuous rating to avoid the risk of damage to electrical equipment. The four-mile, two-mile and one-mile ratings could not be added to the eight-mile rating or to each other.

The new short-time ratings have been changed from miles to hours and minutes and have been calculated cumulatively. This means the locomotive can be operated continuously at 825 amp., then in overload for two hours at 850 amp., then for another half hour at 900 amp., then for an additional quarter hour at 925 amp., making a total of 2¾ hours in overload. To correspond with the new basis for short-time ratings, dial markings of the F7 transition meter now show the measure of traction-motor current in amperes. The dial is marked to indicate the continuous rating and the dynamic-brake rating. A plate below the dial explains the new short-time-rating method of operation.

The new design improvements can be built into old traction motors to bring them up to the new standards. The new motor is physically interchangeable with the D17 and D7, but new ratings will not apply to the F2 and F3 locomotives unless changes in traction-motor cooling and power cables are made in addition to the motor improvements.

The D-27 traction-motor frame is the same as the D17, except that small air baffles are added to the frame between field coils at the pinion end to balance the air flow for armature and field-coil cooling.

The armature incorporates the moulded coils and inorganic silicon, glass and mica insulation introduced in the D17 motor several months ago. This new type insulation, together with stronger, high-tensile banding, more durable solder, and more secure wedging results in a harder, longer wearing coil



Speed-tractive-force curve of an F7 1,500-hp. Diesel-electric locomotive unit. Eight gear ratios are shown

of fixed sectional dimensions which fits the slot more perfectly, will not absorb moisture, and is highly resistant to deterioration. The only other change made in the armature for the D27 motor is that an air baffle is removed from the pinion end as part of the redesign of the traction-motor cooling system.

Organic material has also been eliminated in field-coil insulation. The inner field coil is now made of the same cross-section bar as the outer coil. Each coil is wrapped separately and there is no longer a wrapping covering both. Bolted and soldered leads from coils are eliminated. The leads now form a part of the copper-bar coil and are low-temperature brazed to leads from the next coil.

The only change in interpole construction is the substitution of inorganic insulation for organic. Leads on interpole connections are now brazed instead of soldered. All four interpoles are now identical, with only two different bus bars used as connectors. In the D17 motor four different coils were used due to the difference in lead lengths.

The net result of the new design is a smaller overall coil, allowing more space between coils for better ventilation. Heat transfer out of the coils has been greatly improved and, since the inorganic insulation will not shrink, the period between removal of coils for inspection is lengthened considerably.

Brush-holder connectors have a new compression fitting which eliminates solder and improves the electrical connections.

Size and capacity of the traction-motor leads have been increased from the former 775-24 cable to 1100-24 cable. Cables have a new Neoprene outer covering. Locomotive cable has been increased from 1100-24 to 1600-24.

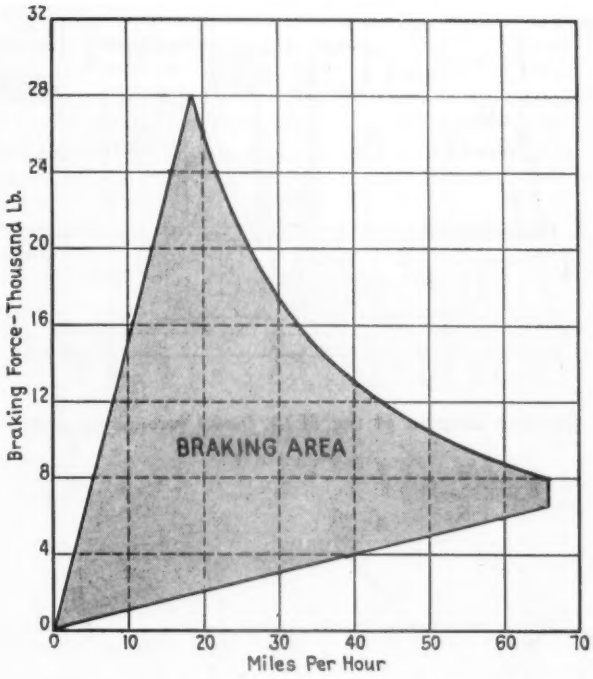
Traction-motor cooling capacity in the new F7 has been increased by a new blower assembly. It is physically interchangeable with old units and can be used as a replacement on F2 and F3 units.

Axle-bearing caps have been redesigned for better coring and easier cleaning of the casting. The opening for lubricators is greatly enlarged to facilitate cleaning, oiling, assembly and disassembly. It also provides greater oil capacity. A new felt-wick lubricator insures more positive lubrication and also reduces the possibility of error in installation.

Automatic transition, successfully used in General Motors high-speed passenger locomotives for many years is now standard equipment on F7 heavy-duty locomotives. Without automatic transition, the changing of connections between traction motors to give variations in performance for varying requirements in starting, accelerating and maintaining speed with heavy loads has been a manual operation performed with a control lever by the engineman on the F series locomotives. Damage to equipment sometimes has resulted from improper handling of the control. Automatic performance of the various shifts as a locomotive gathers or reduces speed relieves the operator of this responsibility and contributes to greatly improved train handling.

Increased Train Heating Capacity

The increase in train heating capacity is one of the most noteworthy improvements in the F7. F3A



Dynamic braking characteristic of an F7 locomotive unit with 62:15 gear ratio

units were equipped with 1,600-lb.-per-hr. steam generators and B units with 3,000-lb. generators. Thus a two-unit 3,000-hp. F3 locomotive in passenger service could have a maximum steam generator capacity of 4,600 lb. per hr. This, normally, has proved to be sufficient, but the capacity of the locomotive to pull extra cars and mixing of old and new cars in consists during and since the war, in extreme sub-zero weather, sometimes has resulted in inadequate heating.

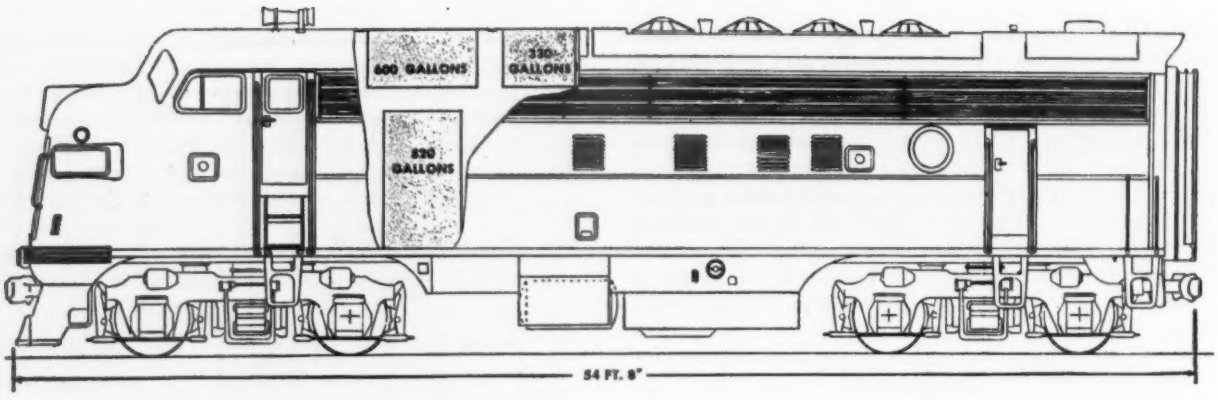
In the new F7, the A units have 2,500-lb. steam generators and the B units can be equipped with either 2,500-lb. or 4,000-lb. generators. Thus the total in a two-unit F7 locomotive may be 6,500 lb., or an increase of 1,900 lb. over the F3 maximum. In a four-unit F7, the total capacity can be 14,500 lb. as against 10,600 lb. in a four unit F3.

More Water Capacity in the FP7A

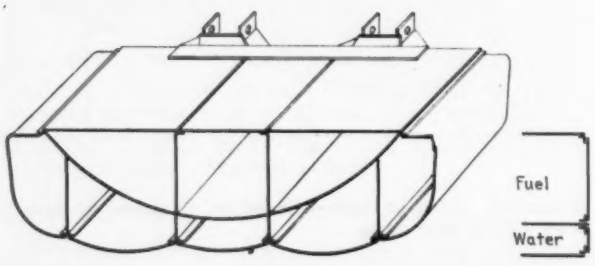
The new FP7A incorporates all the improvements of the F7 and is provided with an addition of four feet in length. This permits the installation of an additional 950 gal. of train-heating water. Total water capacity is 1,750 gal. The F3A units had a maximum of 800 gal. water capacity. This special locomotive unit was designed to meet the needs of railroads with long passenger runs in which it is desirable to lengthen the distance between water stops. The FP7A can be combined at will with F7 or F3 units. It is made only in A units.

Features of the New E8

Improvements in the E8 high-speed passenger locomotive include greater continuous tractive force, increased horsepower, increased train heating, dy-



Elevation diagram of the FP7A Diesel locomotive unit showing location of the water tanks



Cross-section showing construction of combination fuel and water tank—The end-plate construction is shown at the right

namic brakes, a.c. drive for all auxiliaries, eliminating all V-belts, controlled engineroom temperature, pressurized, completely filtered engine-room air system, and increased train-heating water capacity.

The E8 retains the major, proved advantages of General Motors high-speed passenger locomotives of the past, notably reliability on the road and speed with stability and safety that come from dual power plants, six-wheel outside-swing-hanger truck design, and locomotive length, height and width with balanced distribution of weight. The same improvements in traction motors described for the F7 are utilized in the E8.

Horsepower rating of the E8 is raised to 2,250 per unit as compared with the 2,000 hp. rating of the E7. Maximum continuous tractive force per unit is 27,000 lb., compared with 21,400 lb. in the E7.

The alternating-current auxiliary drive, an important feature of the F3 in 1946, is standard equipment in the E8, made possible by the new a.c.-d.c. generator especially designed for this locomotive. All V-belt drives are eliminated in the E8 and the isolated a.c. drive for accessories permits a simplified arrangement of equipment in the engine-room that facilitates faster maintenance and repairs with lower costs.

As in the F7, outstanding improvement in train heating equipment has been made in the E8. For years, 2,250-lb. steam generators were regarded as suitable for a 2,000-lb. passenger unit. During the past two years this has been increased generally to 3,000 lb. per unit. But post-war experience has indicated that still greater capacity is needed due to the use of this locomotive with longer trains and mixed equipment. By rearrangement of the engine-room equipment, each E8 unit now can have either one 4,000-lb. or two 2,500-lb. steam generators.

For instance, in a two-unit E7 locomotive, a maximum of only two 3,000-lb. steam generators gives a total of 6,000 lb. capacity. If one boiler fails the train will lose half its heat and the remaining 3,000 lb. may not be adequate in bitter weather. In two units of the E8, four 2,500-lb. generators may be installed, giving a total of 10,000 lb. capacity. If one boiler fails, the remaining three still will deliver 7,500 lb., or 1,500 lb. more than the old maximum in the E7.

The train-heating water range of the E8 also has been importantly increased by the addition of an extra 600 gal. roof tank, bringing the total per unit up to 1,800 gal. This extra 600 gal. lengthens the distance between stops normally necessary for taking on water.

Engine-Cooling Air

Engine-cooling air, isolated from engine-room air in the E8. Engine-room air is taken from the sides of the locomotive, and forced through filters by an a.c.-driven fan into the engine-room, delivering an adequate supply of clean air to the engine-room under pressure. This new feature not only serves to increase engine life but also reduces maintenance costs on other equipment located in the engine-room because the pressurization tends to prevent dust and snow from seeping into the room through any leaks that might develop after long, hard service of the locomotive.

Engine-room temperature control in extreme cold weather is aided by a new arrangement of shutters which allows a portion of the warm, discharging air from the engine-cooling system to be directed through the engine-room filter bank. This raises the temperature of the engine-room. This feature with jacketing of pipes practically eliminates the danger of freeze ups in the engine-room which sometimes have been encountered in extreme sub-zero weather in the past.

Hot weather operation of the E8 is substantially

improved by increased capacity of the engine-cooling system, with more effective air flow and greater fan capacity. The same general cooling system successfully employed on the F3 for the past three years is used on the E8.

A simple expedient has been adopted to protect the under-floor fuel tank from puncture by objects hurled up from the right-of-way. It consists of a new double tank with an outer compartment containing water and an inner compartment carrying fuel. Besides protecting the fuel tank, this arrangement makes it possible to eliminate cold-weather fuel problems by steam-ejector heating of the water in the outer tank.

Diesel Maintenance On the Central of Georgia*

The first of a two-part article on work scheduling and engine maintenance—Repair cost data included

By E. H. Holloway†

FOR Diesel locomotive maintenance, the Central of Georgia considers Macon, Ga., as the hub of a wheel with the spokes representing lines running in all directions to outlying points. The Diesel locomotive repair shop, as well as the principal repair shop for steam locomotives is located at Macon. At outlying points only running repairs and daily and monthly inspections are made. For heavy repairs and annual inspections, the switchers are moved to Macon in tow by freight train accompanied by a messenger.

Switching Locomotives

The first C. of Ga. Diesel, placed in service August 18, 1939, was a 600-hp. Electro-Motive switcher. Today, the Central of Georgia has in service 23 Diesel switchers, the latest one a 1,000-hp. American Locomotive Company product put in service April 16, 1948. This fleet consists of two 660-hp. and eleven 1,000-hp. Alcos; one 660-hp. and three 1,000-hp. Baldwins and four 600-hp. and two 1,000-hp. Electro-Motives. These switchers are located at Savannah, Augusta, Atlanta, Albany, Columbus, and Macon, all in Georgia, and Montgomery, Ala., and Chattanooga, Tenn.

The switchers at all points are assigned to 24- or 16-hour service, seven days per week. No switchers are assigned to less than 16-hour service. At all locations the switchers receive a daily inspection during the operating crew's lunch period, usually on the first shift. In most cases the switcher does not come into the shop, but is given this inspection in the yard by a shop mechanic and helper sent out from the shop, sometimes by truck. Each switcher is given a monthly inspection requiring that it be taken out of service for approximately eight hours. About the same time is required for quarterly and semi-annual inspection.

One switcher located at Montgomery is operated and maintained by the Western Railway of Alabama,

One of the three tracks in the main Diesel shop building of the Central of Georgia at Macon, Ga.

† Superintendent Diesel Maintenance, Central of Georgia.

* An abstract of the first part of a paper presented before the Southern & Southwestern Railway Club on January 20, 1949, at Atlanta, Ga. The details of engine maintenance and the discussion of that subject will appear in the second part.

as a joint facility, and one switcher located at Augusta, while operated by C. of Ga. crews, is maintained by the Charleston & Western Carolina.

Our availability record is based on each switcher meeting its assigned number of daily shifts and it is shown unavailable when it fails to meet this assignment and must be relieved by steam power for inspection repairs. The maintenance and operation cost is on an hourly basis. The record for Diesel switchers since ownership, beginning August 18, 1939, through November, 1948, is shown in the table.

Handling Passenger Units

All of our Diesel road locomotives are Electro-Motive equipment, consisting of ten 2,000-hp. passenger and nine 1,500-hp. freight units. All are "A" units. The maintenance on these locomotives is performed at Macon and only trip inspection and necessary running repairs are made at outlying points. We use the slide rule method of progressive maintenance based on 2,500 miles for freight and 3,000 miles for passenger.

The ten passenger units average 13,400 miles per month per unit. Nine of these are assigned as a single- and four double-unit locomotives to scheduled trains. The remaining unit is used as a swing and shop unit, relieving the other nine units for mileage inspection and repairs. The availability record is based on each unit filling its assigned schedule and being exchanged at Macon for the swing unit without any loss of schedule assignment or relief by steam power.

Seven passenger units were placed in service in August, 1946, one unit in October, 1946, and two units in June, 1948. The performance record and cost of maintenance and operation per mile for the ten passenger units since ownership, August 18, 1946, through November, 1948, is given in the table.

Freight Assignments

The nine freight units average 9,000 miles per unit per month. Eight units are assigned as double-unit locomotives to scheduled trains. The remaining unit is used as a swing and shop unit, relieving the other eight units for mileage inspection and repairs. The swing unit, when not required for relief duty, is assigned to a scheduled train. The availability record is based on the double-unit locomotives filling the assignment to scheduled trains and being exchanged at Macon one unit at a time for the swing unit without any loss of schedule assignment or relief by steam power.

Four freight units were placed in service in December, 1947, and five units in May, 1948. The performance record and cost of maintenance and operation per mile for the nine freight units since ownership December 12, 1947, through November, 1948, are shown in the table.

In addition to maintaining 23 switchers and 19 road locomotives at Macon, as of October 15, 1948, we have assumed complete maintenance of one 1,500-hp. Electro-Motive freight unit owned and operated by the Georgia Railroad between Macon and Camak. The maintenance on this locomotive is set up and performed exactly as if it were a Central of Georgia locomotive. However, it requires relief by steam power for mileage inspection and repairs. This locomotive will average 8,500 miles per month.

The Diesel locomotive shop at Macon* was formerly a part of the boiler and tank shop. This shop building is now completely separated from other departments, and used only for the specialized work of Diesel locomotive maintenance with its own shop personnel.

The force on the first shift with a six-day assignment is comprised of one foreman, five machinists and helpers, two electricians and helpers, two machinist apprentices and helpers, one pipefitter and helper and two laborers. The Sunday and holiday assignment on the first shift includes two machinists and helpers, one electrician and helper, one pipefitter and helper and one laborer. A skeleton second shift force on a seven day assignment includes one machinist supervisor and helper, one machinist and helper, one electrician and helper and one laborer. There is no third shift in the Diesel shop. Trip inspections and running repairs on the third shift are performed by steam-locomotive roundhouse forces.

The Macon Diesel shop building is 260 ft. long by 70 ft. wide, with elevated platforms and depressed floors. It has three inspection-track pits 150 ft. long, and one truck-repair pit 32 ft. long.

At the present time the Central of Georgia is assembling machinery and equipment for an electrical repair shop, and expects within the next few months to be in a position to make all necessary repairs to Diesel-locomotive electrical equipment. This equipment is now being repaired by outside shops.

* For a description of the Macon shop see Page (149), April, 1948 issue of the *Railway Mechanical Engineer*.

DIESEL MAINTENANCE AND OPERATING COSTS

SWITCHING LOCOMOTIVES, PER HOUR

Loco.	Availability* per cent	Repairs, dollars	Fuel oil, gal.	Lube oil, pints	Other supplies, dollars	Total, dollars
600–660 hp.	92.7	.629	6.60	.77	.017	1.137
1,000 hp.	93.6	.717	7.54	.72	.015	1.294

PASSENGER UNITS, PER MILE

Miles Assigned	Miles operated	Availability* per cent	Repairs, dollars	Fuel oil, gal.	Lube oil, pints	Other supplies, dollars	Total, dollars
2,882,417	2,882,417	100.0	.087	1.89	.15	.002	.261

FREIGHT UNITS, PER MILE

Miles Assigned	Miles operated	Availability* per cent	Repairs, dollars	Fuel oil, gal.	Lube oil, pints	Other supplies, dollars	Total, dollars
704,118	704,118	100.0	.045	2.02	.14	.002	.265

* See definition in the text.

Flame Shape-Cutting in Railroad Shop Operations*

How flame cutting produces savings in duplicating parts—Flux-cutting method eliminates clamping

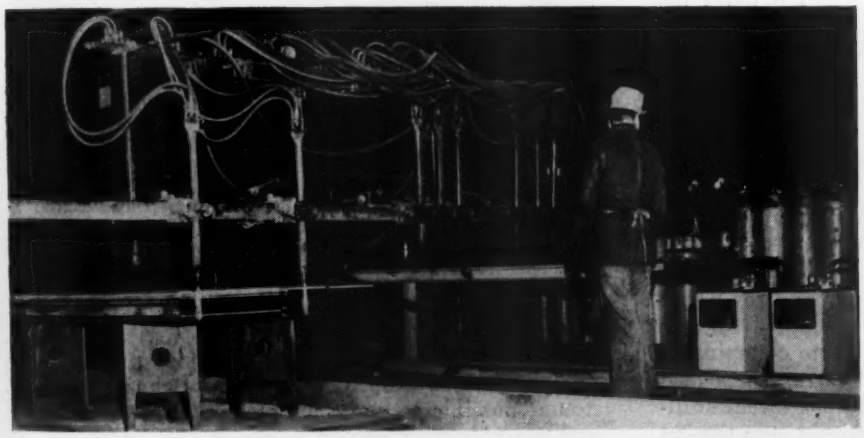
By F. B. Rykoskey†

A MAINTENANCE tool must measure up to two standards—one, of quality, the other of efficiency. The first can never be sacrificed to the second at the cost of safety, durability, or operability. The second, however, should not be sacrificed to obtain a higher quality result than is justified by the requirements of the job, althought quality must always come first. Considered on this basis, oxyacetylene shape-cutting is an outstandingly valuable means of economizing and expediting the work of railroad shops. It measures up to the requirements, and is in itself a simple and efficient operation without comparison with alternative methods.

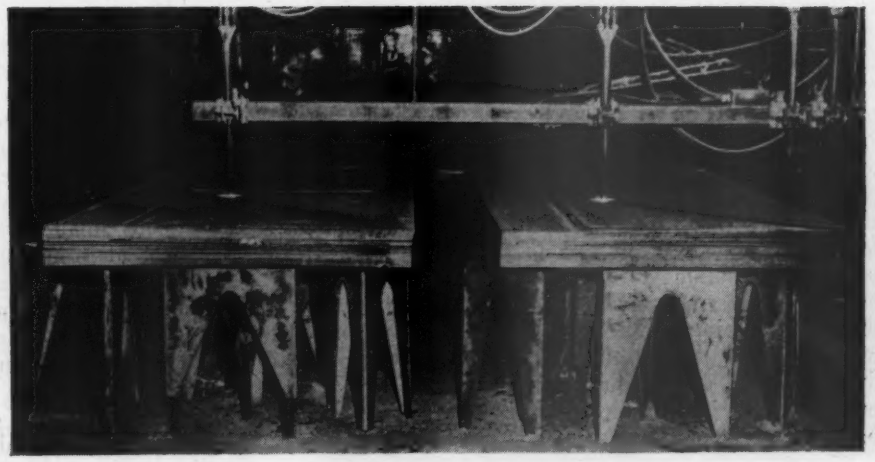
This problem has been, in the past, rather more of a threat with stack-cutting operations than in cutting single thicknesses with multiple torches. The whole theory of stack cutting, since its inception, has

† Supervisor of shops, Baltimore & Ohio.

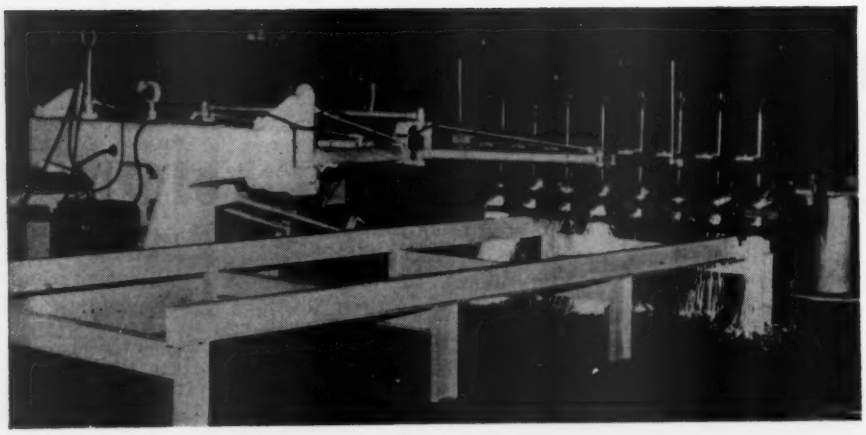
* An abstract of a paper presented before a session of the 49th annual meeting of the International Acetylene Association on April 26, 1949, at Pittsburgh, Pa.



Stack-cutting with Flux-Injection method and two torches mounted on the travograph.—Note the complete absence of clamping of the material, 12 plates high



Three-legged, moveable work supports provide valuable help in speeding and simplifying the stack-cutting job—They can readily be positioned away from the line of cut, and the support area can be arranged to suit the size of the work



A travograph mounting eight torches cuts eight groups of duplicate car parts from tightly clamped sheet-material stack

been to obtain such intimate contact in a pile of sheets or plates that the steel layers, to all practical purposes, act as one solid thickness of metal. This has been found necessary to prevent loss of the cut, which usually meant scrapping the stack and has required extensive clamping measures to eliminate air gaps and bring the plates into intimate contact. In spite of the cost and time involved in such set-up work, there are, and continue to be, many applications of the stack-cutting method which are economical and efficient. This is particularly true where highly irregular contours and curves defy the capacity of shears and other mechanical means. When the difficulty of mechanical shaping of such parts has proved too great or too costly, stack-cutting has been applied efficiently despite its elaborate set-up requirements.

Flux-Injection Method

There is available today, however, a means of stack cutting which puts the torch in direct competition with shearing, even on straight-line contours, and shows substantial savings in many cases. This is stack-cutting by the Flux-Injection method, a process developed by the Air Reduction Company for flame-cutting stainless steels, and recently adapted for cutting mild steel in stacks with little or no clamping of the plates. The material is simply laid up in a neat pile, clamped, if at all, only enough to prevent shifting, and cut. The air gaps, which would stop the cut in conventional operation, appear to have no effect and cutting proceeds rapidly and successfully, yielding a good quality result.

The Flux-Injection method uses standard equipment, including a three-hose machine cutting torch, plus a special flux-feeder unit for each torch. The "secret" of its operation is the addition to the cutting oxygen itself of a controlled amount of a special finely powdered fluxing agent. The fluxing medium is carried by the cutting oxygen stream itself. The flux-feeder unit, coupled into the cutting oxygen line, dispenses the non-metallic power from a vibratory hopper, and it emerges right with the cutting oxygen through the orifice of the tip to reach the exact point of cutting. In the cut the flux acts to increase the fluidity of the slag, clearing the kerf, and aids the oxygen stream in "jumping" whatever gaps may exist between layers. With this method, gaps as great as

Stack cutting, with multiple torches, makes the flame a production tool—Note the heavy clamping required here to hold the sheets in intimate contact, and compare with the Flux-Injection method

one-fourth inch have been so "jumped" without loss of quality or cutting effectiveness. It has also been found possible to stack-cut plates ¼-in. thick without any clamping, straightening or other measures—just as they come to the shop, without special handling to preserve or correct their flatness.

The Flux-Injection method of stack cutting has been further increased in effectiveness by making it a multiple-torch operation. Two torches are in regular use on the Travograph, each provided with its flux feeder unit for simultaneous cutting of two batches for duplicate parts. The operation provides even further economies in the stack cutting of miscellaneous small parts from the scrap which results from the main operation.

The parts which are cut by this method are, in the main, sheet and plate shapes used in the fabrication and repair of cars, although any material of suitable thickness can be stack-cut if it is suitable for cutting at all. There is no difference, so far as physical or metallurgical qualities are concerned, in flux-injection cut materials.

Flux-Injection Savings

The savings possible with this method have proved highly worthwhile. Routine production work, week in, week out, has shown an average saving of about 40 per cent as compared with the previous method of shearing and trimming with a hand torch. This is based on the use of a two-torch set-up with plates stacked to a height of between four and five inches, with little if any clamping, and on the production of many different sizes and shapes of parts. The savings on individual shapes run as high as 60 per cent, although most units run closer to the average.

Some of the set-up details used for this operation contribute to these savings. To accommodate the variety of contours needed, without the problem of a fixed cutting table, a set of three-legged triangular supports were made up. These supports, arranged as required to hold the work, but leave a clear area under the actual cutting line, eliminates the problem of cutting into the work-support. A more stable, flexible, and longer-lived cutting table is possible in this way, and the difficulties in cutting which might arise from table irregularities are eliminated.

Other Cutting Equipment

While our operations center largely around the Travograph machine, it is not the only shape-cutting machine of value in the railroad shop. Many of the same jobs, for instance, can be done with the Oxygraph, which covers a smaller cutting area, but otherwise is quite similar.

The portable cutting machines, while not usually considered as shape-cutting equipment, can and do play a useful part in such operations. Where long arcs or straight lines are required, they can help absorb some of the shape-cutting load, and particularly in trimming plates for fit-up, as in welding, they provide a valuable measure of flexibility. Their use cuts down handling operations, and covers many on-the-spot cutting requirements. Finally, in the work of plate-edge preparation for welding, in bevelling or grooving, they are indispensable. Fast flexible and ideally suited to the work, the Radiagraph also provides the lowest cost means of plate-edge preparation.

Generally, the use of oxyacetylene shape-cutting in jobs for which it is suited, is a thoroughly economical operating method. It is very likely that it is not yet fully exploited, even by those who have applied it widely in their shops. The jobs for which it has been used successfully, however, point the way to wider use and greater savings with the intelligent extension of the process to new fields.

It is in the duplication of parts in quantity that the modern shape-cutting machines reach the peak of efficiency and productivity. The most versatile machine, with the highest cutting-area capacity, is the Travograph. This is a pantograph-type unit, mounted on a traveling powered carriage. With such a machine in multiple-torch operation, three complete locomotive side frames have been cut at one time, and combined with stack-cutting techniques, smaller parts can be simultaneously produced by the dozens.

The type of part has much to do with the useability of these multiple techniques. While there are numerous locomotive and car parts which can be mass produced, there are also many on which flame-cutting is limited to one-at-a-time operations, and others where only a few at a time can be handled. In these latter jobs, it is usually the function of the cutting torch to provide savings over forging and casting, while with mass-produced parts the saving is by flame-cutting in quantity rather than employing machine or shear work on individual units.

Flame-Cutting Procedure

One important problem in successful shape-cutting of large and heavy parts, such as many of those used in locomotives, is that of accuracy. Its importance lies largely in its effect on possible savings—the closer a cut can be made to the finish line, the less machining or other finishing will be needed. To obtain the best accuracy, certain relatively simple measures are helpful.

Templates should be prepared with precision, and handled and stored with care. Setting up and laying out of the work must be planned and executed carefully. Cutting machine operators, carefully chosen, trained and supervised, play a considerable part. On complicated work, the sequence of cutting, skip-cutting, etc., are useful allies. In cutting sizable areas, a non-restraining supporting surface helps to reduce the effects of snaking and other plate movement caused by heat, and so permits cutting closer to the final line. Careful selection of tip styles and sizes, cutting speeds, gas pressures, routine careful maintenance of the machine and equipment—all these are obviously important. Attention to such measures can greatly increase the precision of the cutting and the quality of the results, and produce greater economy.

Naturally, such attention to the accuracy of the job also tends to reduce the risk of spoiled or poor work. This is an important consideration, particularly in using multiple-torch or stack-cutting techniques, where one error can ruin numbers of parts and sizable amounts of material.

Parts are readily flame-cut to contour in more than one plane, replacing or reducing forging or casting work

EDITORIALS

What About Your Management?

One of the major needs of the railroad industry with respect to the facilities with which motive power and car equipment are serviced and maintained was clearly outlined in the introductory paragraphs of a bulletin entitled "The World's Best Investment," recently issued by the National Machine Tool Builders' Association, in the statement that "All over the country banks, insurance companies, financial institutions and investment groups are constantly surveying their portfolios of stocks, bonds and other securities. These are paper evidence of ownership of manufacturing facilities, including machine tools, in plants of manufacturing companies in the country. In nearly all cases there is an investment committee . . . to watch these securities carefully in order to sell some and to buy others as changes appear in the position of the companies represented by these certificates. . . . .

"The same principle of careful scrutiny of ability to maintain a position should be embodied in the organization of the plants represented by the securities in these portfolios. There should be a committee to see that the major investment of these companies, that is, machine tools, is kept in order, for it is upon the condition of this investment that any plant's ability to maintain its position or improve its prospects depends."

One of the factors operating against the profit-earning abilities of most railroads is that the same financial managers who are so keenly alert to the possibilities of impairment of financial position in a securities portfolio seem not to be aware of the parallel dangers inherent in the change of asset position through obsolescence of such physical facilities as shop and terminal equipment used to service and maintain cars and locomotives.

The railroads' investment in shop and terminal machinery and equipment is a substantial sum and it has been estimated that 75 per cent of it is not only obsolete but is definitely unsuited to compete in today's race even with machine tools and mechanical facilities of ten years ago, let alone the high-capacity labor-saving units that have been developed during the past five years.

It is difficult to understand why, when more than 80 per cent of the motive power of this country is still of the reciprocating steam type, so little interest is shown in the economies which could certainly be secured by modernizing the facilities used to service and maintain the more than 30 thousand steam locomotives. On most roads where Diesels have replaced steam units on the better runs, the cost of maintaining steam power has risen. Aside from increased costs of labor and materials, the principal reason for the mounting expense of that item has been that, with the coming of the Diesel, many railroad officers apparently decided that steam locomotives would soon be gone and, consequently, that there was no good reason to spend money on maintenance facilities for them. This opinion is derived from erroneous assumptions; thousands of steam locomotives are still going to be in service for many years to come.

In recent months many comprehensive programs for modernization of locomotive and car repair facilities have been held in abeyance. As one shop engineer expressed it, "To buy anything that costs more than 100 dollars we'd have to call a meeting of the board of directors." Possibly that is just what is needed, for the portfolio of investment in the shops and engine terminals of most railroads is definitely in need of scrutiny—and at the very highest level of authority and responsibility.

Improved Reefers Reduce Banana Losses

One of the reasons that banana losses are at the bottom of the railway claim list is improvement made in the refrigerator car itself. For the last four years a committee of the United Fresh Fruit and Vegetable Association has been working with representatives of the A.A.R. in developing specifications for a mutually satisfactory refrigerator car design. Generally speaking, before the war, it was difficult to get any real agreement regarding refrigerator-car requirements. Almost every shipper, car owner (whether private line or railroad) and receiver of perishable shipments had his own idea as to the proper amount of insulation, what the inside dimensions of the car should be, whether fans should be used or overhead bunkers, whether frozen foods could be carried in general service reefers, etc.

Towards the end of World War II the need for many new reefers to make up for the lack of building and proper repairs during the war years seemed an ideal opportunity for all interested parties to reach some agreement regarding the design of the post-war car. If the new reefers could carry bananas successfully, it was quite certain they could carry any other fresh fruit or vegetable successfully. For years, "acceptable lists" specifying the best series of refrigerator cars of various ownerships were supplied to shippers' car inspectors who selected cars only from these lists and, furthermore, carefully inspected every individual car offered for banana loading.

The recommendations of the Refrigerator Car Committee, representing the interests of shippers of fruits and vegetables from all parts of the country, called primarily for air-circulating fans, heavy insulation, easier riding trucks, improved draft gears, temperature-indicating devices readable from outside of the car, lightweight construction, low, wide, side-door steps, steel wheels, half-stage icing and uniform inside dimensions. These recommendations have been largely adopted in practically all new cars built since the first committee meeting in 1944.

To develop the facts and cooperate with the shippers' committee, the A.A.R. about two years ago established a Refrigerator Car Research Bureau in Chicago and has conducted about twenty transit tests, mostly in conjunction with the U. S. Department of Agriculture. A summary report of tests made in refrigerator cars from April, 1946, to November, 1947, is devoted largely to results with varying amounts of insulation. Practically all car lines, in the meantime, are using 4 to 4¼ in. of insulation for their new post-war cars, which proves adequate for all commodities with the possible exception of frozen foods.

The A.A.R. and U.S.D.A. test work is said to show that overhead bunker cars have equalled fan cars in performance for frozen foods, but, in the case of fresh fruits and vegetables which are not pre-cooled, the fans have proved superior, as the forced air circulation gives quicker cooling in the early part of the trip than can be obtained by the slower gravity system of the overhead bunker car. Fans have been accepted by practically all railroads and car lines as standard for new cars, and for many rebuilt cars; probably about one-third of the general purpose reefers now in service are equipped. Tests indicate that, for both cooling and heating, the fans keep top and bottom temperatures remarkably close, whereas differences of 13 to 22 deg. often exist in cars without fans.

The only outstanding recommendation of the shippers' Refrigerator Car Committee not yet adopted by railroads in this country, but widely used on Canadian roads, is thermometers for reading inside temperatures outside of the car, which are apparently almost a necessity for the efficient control of icing or heating perishable commodities in transit. If the "inside control" method of perishable protection is to be extended to fruits and vegetables other than bananas on U.S. roads, it will be necessary either to equip the cars with outside-reading temperature-indicating devices or have especially trained field inspectors for testing load temperatures through the opened doors. The opinion is growing that one or the other, or a combination of both these methods of checking inside temperature control is essential to any great reduction in fruit and vegetable claims.

Modern Maintenance Facilities Pay Dividends

In a recent address President Smith of the Norfolk & Western presented some interesting facts on the operation of that road's steam freight and passenger power which, when considered jointly with previously reported data on the low maintenance cost of N. & W. locomotives, gives striking evidence of how modern repair and servicing facilities in combination with well-designed locomotives result in excellent performance at low cost.

Mr. Smith revealed that analysis of I.C.C. records for 1947, the last year for which figures are complete, showed that N. & W. Class A 2-6-6-4 locomotives handled an average train somewhat more than twice as large as the average for the country's road freight Diesel locomotives and handled it at a considerably higher overall speed. The Class A's, moreover, averaged more miles of service per locomotive per day than did the road freight Diesel locomotives of the country as a whole.

Steam passenger locomotives also turned in outstanding operating performances. Again, comparing N. & W. steam power with countrywide Diesel performance, Mr. Smith pointed out that their Class J 4-8-4 passenger locomotives made higher daily mileages than the average Diesel passenger locomotive. This record is all the more remarkable when it is remembered that much of this road's passenger-train mileage is made on a run only 212 miles long.

In considering these comparisons it must not be overlooked that the character of N. & W. freight traffic is particularly well adapted to heavy train loading, while the average performance of all road freight Diesels represents the effect of a great variety of traffic and operating conditions, not all of which are favorable to intensive freight-train performance. On the other hand, the length of passenger-train runs on the N. & W. is probably below the average of the runs made by Diesel-electric passenger locomotives.

It is evident, however, that the steam-power potential is equal to an opportunity such as that offered

by freight-traffic conditions on the N. & W., and that a high degree of utilization is not entirely dependent on long passenger runs. The comparison also directs attention to the fact that, as more Diesels go into service, the average utilization of all Diesels is reduced, once the "cream" of the runs has been skimmed off.

Unfortunately, a large group of railroaders still seem to think that a steam locomotive is limited to a run of only 150 to 200 miles and that, upon completion of even that short run, it must spend a half day or so at the enginehouse. What is all too often overlooked in evaluating the potential of steam power is the effect of modern repair and servicing facilities on availability, utilization and maintenance cost. Where such are employed, as on the N. & W., performance like the aforementioned is well within the realm of possibility, and it can be attained concurrently with low maintenance. The total maintenance costs are in the neighborhood of 20 and 25 cents per mile, respectively, for the Class J's, which are eight years old, and for the Class A's, some of which are in their fourteenth year of service.

Electric Locomotives

There is a growing number of people in this country who are looking forward to the extended use of straight electrification. This will depend upon availability of electric power, possible increase of traffic density in certain locations, the availability of sufficient money and, perhaps, a rise in the price or availability of oil, as compared with coal. An easing of the tax situation which puts a load on fixed property could also do much to further the construction of substations and contact systems. Development of nuclear power plants might have considerable influence.

At present, among the electrics, the Diesel-electric locomotive is in the ascendancy. Nearly all railroad operators expected it to find its limitations long ago, but it has hurdled each obstacle as it came to it, and the limit of its application is not yet in sight.

The gas-turbine-electric locomotive is apparently going to offer the Diesel some competition. At present its thermal efficiency is about 17 or 18 per cent, as against the Diesel's 25 or more, but it can burn a cheaper oil and may, one day, use coal. It is mechanically much simpler than the Diesel and the effectiveness of its competition will probably depend largely upon its having lower maintenance costs.

The coal-burning, steam-turbine-electric has been turning in a good performance record, but apparently its thermal efficiency must be improved if it is to offer serious competition to the other electrics.

The reciprocating steam locomotive is still the dominant motive power unit. It is inherently cheaper and simpler than its various electrical competitors and these qualities will maintain its position in the railroad field if it is not abandoned by its proponents.

The percentage of business which will be gained or maintained by any one type is affected considerably by traffic and operating conditions. It is also largely influenced by minor differences in locomotive characteristics which are subject to development and change. Probably the most important factors are the intelligence and interest shown by the operators of each type.

Technological Limitations

In an address on March 17 before the Pacific Coast Transportation Advisory Board at Oakland, Calif., on the possibilities for profitable railway research, Weldon B. Gibson, chairman, Business and Industrial Economics, Stanford Research Institute, Stanford, Calif., includes among what he considers the five major underlying problems of rail transportation a lack of sufficient advance in technology, especially as compared with other forms of carriers. No real basic changes, he says, have been made in rolling stock for many years.

He recommends a number of basic surveys, using experimental rather than analytical methods, to furnish facts now lacking concerning effects of dynamic loads both on car structure and lading.

Such a program would undoubtedly bring to light facts of inestimable value to the car designer in his efforts to protect both the car structure and the lading from the damaging effects of dynamic forces.

In calling attention to the extent to which present A.A.R. specifications restrict the freedom of action of the designer, however, Mr. Gibson has hit upon one of the difficulties inherent in an old industry, particularly one in which units of mechanical equipment must be freely interchanged and capable of successful operation with all other similar units. Basic freight-car characteristics, methods of coupling, and the system of braking were established long ago, and have been subjected to continuous improvement. A great increase in reliability was effected between the two World Wars. Possibilities for continued improvement gradually take on the nature of relatively minor refinements.

Can a major reduction in the cost of conducting transportation as affected by rolling stock be expected from a continuance of this process? If not, what are the possibilities of complete departure from present familiar characteristics to start the process of evolution anew?

SHOPS AND TERMINALS

Power-Operated Superheater-Unit Truck

A superheater-unit truck with power-operated puller for removing units is used at the Oakland, Calif., shops of the Southern Pacific. Salvage materials were used for a large part of the truck. Most of the fabrication is by welding.

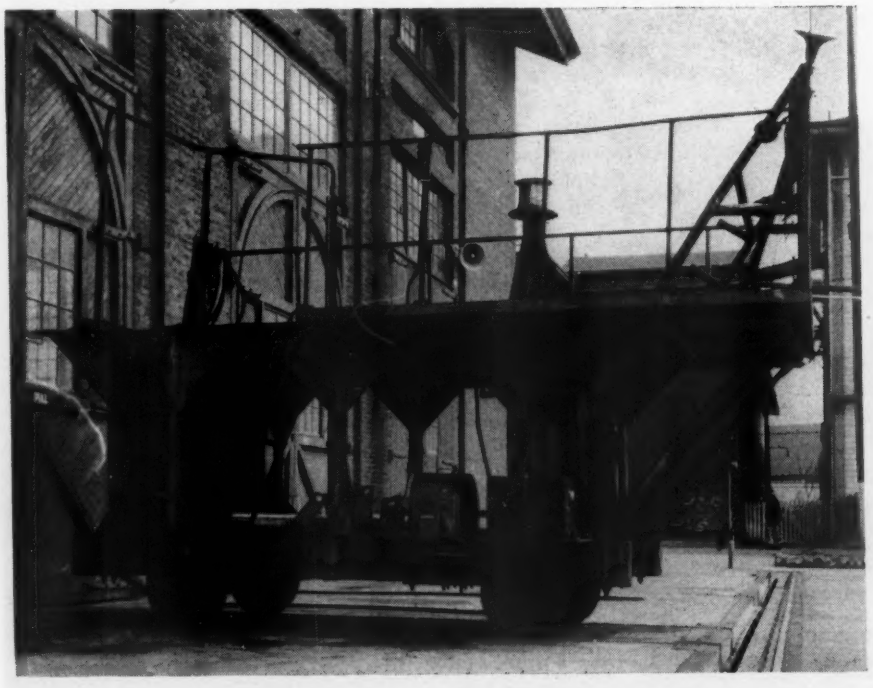
The truck consists of four 24-in. flanged wheels and a low frame on which is built a superstructure with an elevated metal platform 9 ft. 6 in. by 19 ft., about 7 ft. above the rail. The power equipment consists of a 15-hp. 1,700 r.p.m. motor, driving the capstan on top of the platform by means of a 1:40 ratio, worm gear and vertical shaft arrangement. There is also a 12-ft. jib crane with a 1,000-lb. electric hoist to facilitate transferring units on and off the truck platform.

In operation, this truck is backed up against the locomotive front end and one end of a rope is fastened to the superheater unit to be removed, the rope having been run through a block located in the proper position on a bracket to prevent offside pulling. A few loops of the rope are then coiled around the capstan, which is in continuous operation. A man controlling the tension on capstan end of rope can control the pull and rate of speed at which the unit is removed. Units are sometimes bent when cemented in with sand and carbon, but with ordinary care, little or no bending is experienced. The truck can be made to be self propelled by means of an appropriate chain drive arrangement between motor and axle through a suitable simple control device, if desired.

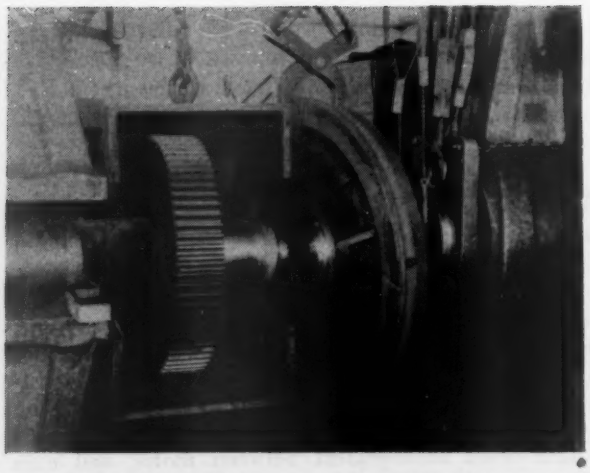
Press Attachment for Removing Diesel Wheels

A device developed at the Sacramento, Calif., locomotive shop of the Western Pacific, for removing Diesel locomotive wheels at the gear end of axles without disturbing the gear fit is shown in the illustration. It consists of a heavy steel semi-circular enclosure which, in application, is placed around the driving gear with one side bearing against the press center bar and the other against the wheel in such a way that, when ram pressure is exerted, the axle is pressed out of the wheel before the gear comes in contact with the press ram.

This press attachment is made of 1-in. boiler steel



Power-operated truck which greatly expedites the removal and re-application of superheater units on the S.P.

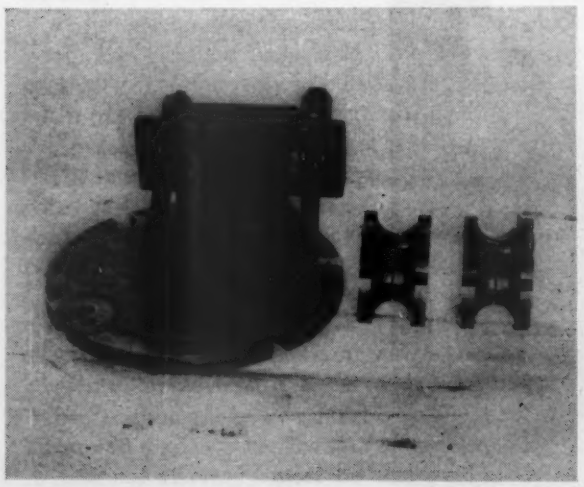


Removing a Diesel wheel without disturbing the gear fit

plate. Two semi-circular end plates, cut out at the center to accommodate the axle on one side and the press ram on the other, are fitted and welded to a circumferential back plate to form a single rigid assembly. The outside diameter of this device is 37 in. and the distance between end plates is 22 in., the semi-circular center openings being approximately 18 in. in diameter. An I-bolt inserted in the top of the device enables it to be supported from a jib crane while being handled and used.

Milling Trailer and Engine Truck Rockers

The wearing surfaces on locomotive trailer rockers are built up by welding and then milling to the required contour on a holding fixture in use at the Springfield, Mo., shops of the St. Louis-San Francisco. After the rockers have been built up by arc welding, annealed, and the bottom lugs form milled to size and shape, the rocker is placed in the jig for milling the top surfaces.



Holding fixture for milling trailer rockers—On the right are the form fillers for milling the bottom bearing surfaces

The jig has a base 1 in. thick and 16 in. in diameter with a hole in the center. There are four slots, 1 in. by 2 in., in the circumference to secure the base to the table. Welded to the base is a block 8 in. high which is shaped to fit the side of the rocker and has a vertical semi-circular slot. This slot is concentric with the hole in the center of the base, and in it rests the bottom bearing of the rocker being milled. The rocker is held next to this 8-in. block with the bottom bearing, which is the center of the circular surface being milled, resting against the semi-circular groove in the block.

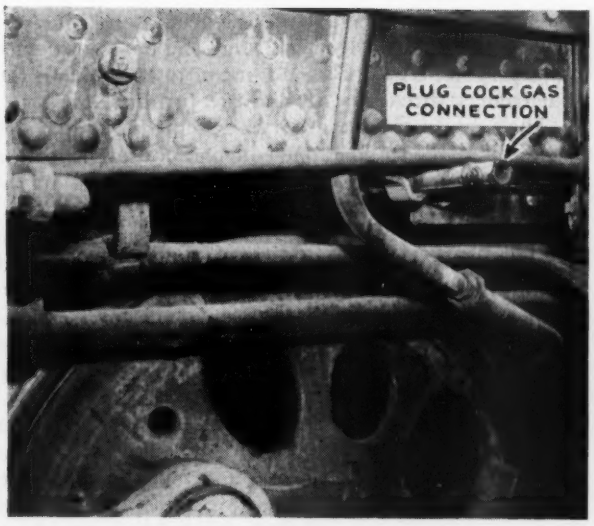
A plate 1⅛ in. by 4 in. by 11¼ in. is welded to the vertical surface of the block near the top. The bottom of the plate is 3 in. above the circular base. Near each end of this plate is a 1½-in. hole through which fits a 1-in. eyebolt. The threaded ends of the eyebolts extend through these holes and the eyebolts are restrained from pulling through by the nuts on the ends. The eyes of the eyebolts fit between the inside of the edges of the rockers and hold the rocker by a bar between the eyes.

Gas Firing Makes Saving of $3.03

Certain types of equipment used in firing up oil-burning steam locomotives on the Southern Pacific and other roads utilizes a plug cock extended to a point just outside the mud ring of the locomotive. This piping is connected directly to the fuel-oil pipe near the burner. In operation, the locomotive firing valve is closed and gas enters the firebox through the oil slot of the burner. The blower is used in the ordinary manner, but the steam atomizer to the burner is not used.

In lighting the fire, the blower is first placed in operation to create a draft. Before the gas line is connected to the locomotive, the firing valve is closed and "blow back" is used to force fuel oil out of the line to the burner. After the gas is connected, but before it is turned on, a piece of oily waste is ignited and thrown into the firebox near the lip of the burner. The firebox door is closed; all persons leave the cab; and the gas is turned on slowly until ignition takes place. A fairly low fire is used at the start for 5 or 10 min., or longer if time permits, before turning gas on sufficiently to fill the firebox with flame. If the fire goes out from any cause, the gas is immediately turned off and the blower used freely to clear all gas from the firebox and flues before attempting to relight the fire. A wait of at least 10 min. is required before the fire can be relighted and no attempt should be made to relight the fire from hot brickwork.

Regarding economies effected, oil-burning steam locomotives are ordinarily fired with gas to 150 lb. per sq. in. After this pressure is obtained, fuel oil



Plug cock gas connection extended to a point just outside the mud ring

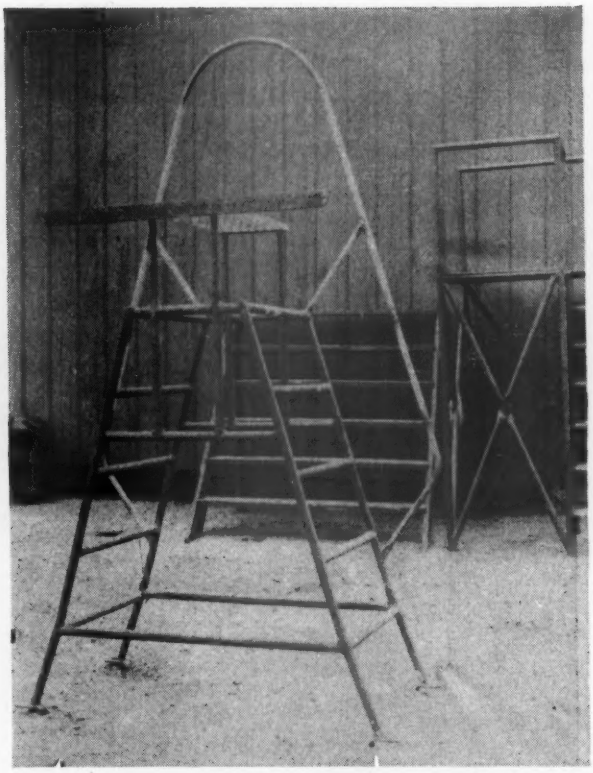
is used to build up the pressure to normal. To obtain the initial 150 per sq. in., a cab-ahead locomotive such as used on the Southern Pacific burns, on the average, 156 gal. of fuel oil. On the basis of 18,400 B.t.u. per lb. and natural gas at 1,000 B.t.u. per cu. ft., 23,000 cu. ft. of gas are required. Using present average costs of fuel oil and gas, this results in a saving of $3.03 per locomotive when gas is used for initial firing, instead of fuel oil.

The Southern Pacific is experimenting with means of firing up coal-burning locomotives in this manner by the use of auxiliary cast-iron burners similar to standard burners, but this test has not progressed to a point where its merits can be definitely determined.

Safety Ladder

A safety ladder for climbing on or off locomotives with the tender removed which does not take up any aisle space between the enginehouse tracks has been constructed at the St. Louis-Southwestern Pine Bluff, Ark., shops. The ladder rests over the pit on four angles which fit the top and inside of each rail in a manner similar to a wheel flange. The top of the ladder is made from metal non-skid freight car running board and is adjustable for different height decks. It is bordered on the locomotive end by a 5-ft. length of ¼-in. angle iron on which the apron rests.

The ladder is built from second-hand 1½-in. superheater units welded to the several members. The rungs are spaced 13 in. apart vertically and are 28 in. wide inside. The bottom angles which rest on the pit rails are made from ⅜-in. plate 2 in. wide bent to an angle shape with a 4-in. horizontal and a 1-in. vertical leg. Conduit tubing 1 in. in diameter is used for the hand rail. The top section is supported on four lengths of ¾-in. piping which slides



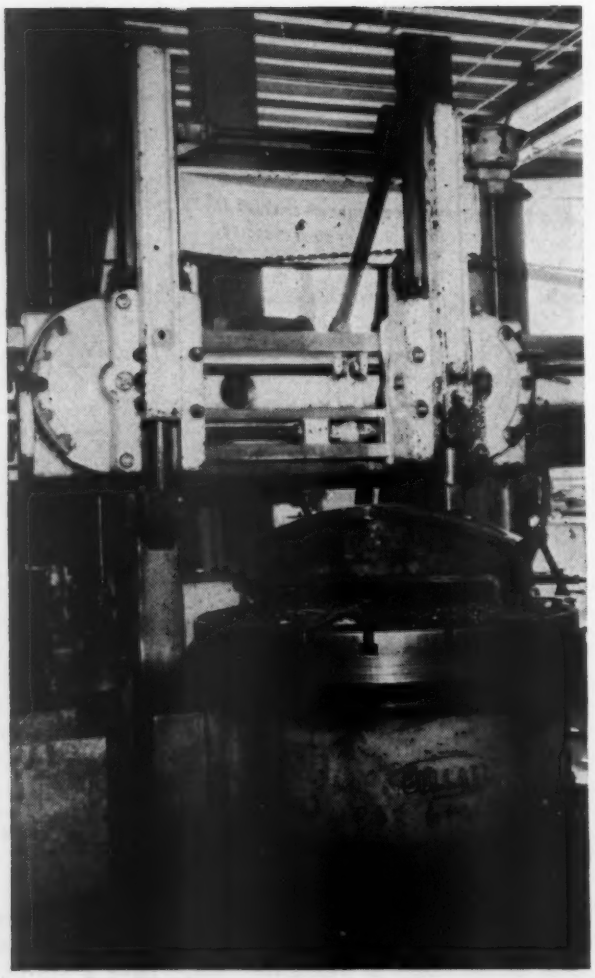
Ladder for boarding locomotives with tenders removed—The small angle-shaped plates welded to the bottom of each leg fit the insides of the rails like a wheel tread

inside the superheater units for height adjustment to the decks of various classes of power. The pipes, as well as the tubes in which they slide, have a 7/16-in. hole every 3 inches through which a ⅜-in. bolt fits. The four bolts in the four legs support the top and make possible its adjustment to various heights.

Machining Radial Buffers

The spherical surface of radial buffers is generated by a simple modification made to a Bullard 54-in. vertical boring machine by the shop forces at the Union Pacific's Omaha, Neb., shops. The modification consists of a series of bars with lengths equal to the various radii of the different styles of buffers in use. The lower end of the bar is attached to the center of the cross-rail and the upper end to the right tool holder. As the tool feeds toward the center of the machine it is raised vertically and describes an arc with a radius equal to the length of the bar. With the buffer turning about its center on the table of the machine, the movement of the tool in an arc generates the desired spherical surface of the radial buffer.

The buffer is bolted to a flanged bracket plate which, in turn, is centered and bolted to the machine table in the usual manner. The point of attachment



Radial buffers being machined to a spherical surface—The radius arm which causes the feed to move the tool along the path of an arc is shown connected to the rail at the bottom and to the tool-holder extension at the top

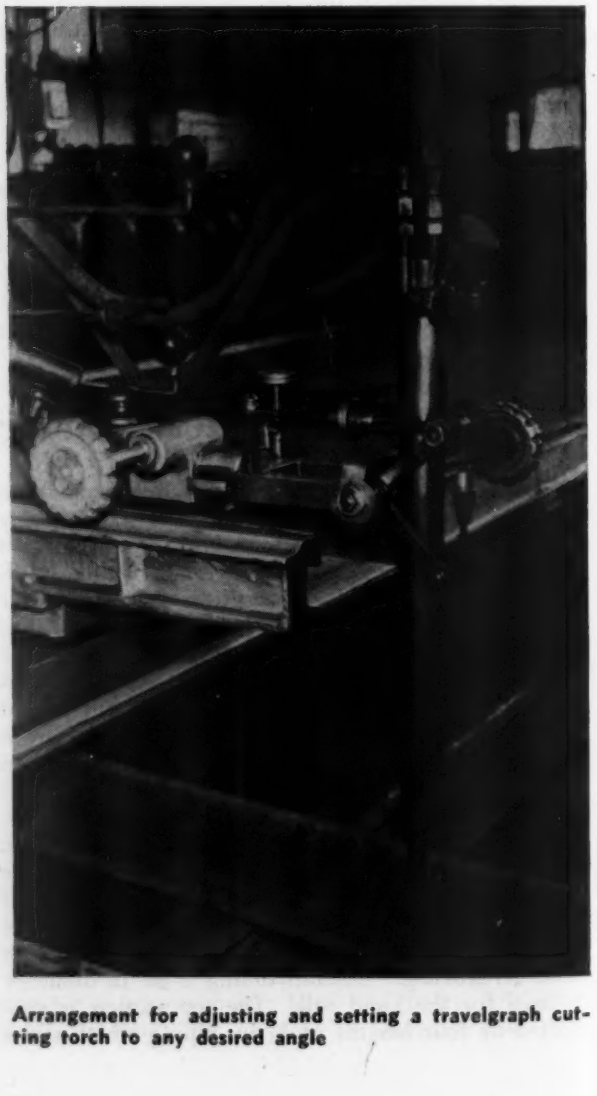
of the lower end of the radius bar to the rail is in a vertical plane, which contains both the center of the buffer and the center of the table, and is perpendicular to the front of the rail. It is about this connection which the bar pivots and moves the tool through its arc path by means of the bar's upper connection to the tool holder. Freedom of motion up and down for the tool holder was achieved by removing the raising gear that engages the rack. For machining buffers with a radius exceeding 29 in., and which, therefore, require a bar more than 29 in. long, an extension made of 1¼-in. plate bolts to the top of the tool holder.

Adjusting Travelgraph Torches

An adjusting arrangement has been added to a conventional Oxweld shape-cutting machine at the Marshall, Tex., shops of the Texas & Pacific which permits the cutting torch to be set accurately and held rigidly at any desired cutting angle. The device consists essentially of an extension to the jaw on the quadrem, a threaded post and two turnbuckles.

The jaw on the quadrem is extended 2¼ in., and a hole is drilled and tapped in one corner. Into this hole is screwed a post 2 in. high and ⅝ in. in diameter. The post serves as a stake to which is connected one end of a horizontal turnbuckle which is used to tilt the torch to any angle. The other end of the turnbuckle connects to the top of a triangular-shaped fulcrum which serves to hold the torch. Turning the nut on the horizontal turnbuckle pivots this torch holding member about a point formed where the two arms join together.

After the torch has been set at the desired angle for cutting by the horizontal turnbuckle, it is tightened in position by the vertical turnbuckle. The adjusting nut is turned so as to expand the opening between the two jaws of the torch-holding member; each pivots in an opposite direction about the shaft where they are joined together at their opposite ends. This forces the two pulley-shaped wheels tightly against the torch and holds it in position, where it cannot be raised, lowered, or tilted to any other angle.



Arrangement for adjusting and setting a travelgraph cutting torch to any desired angle

QUESTIONS AND ANSWERS

The question and answer department is included for the benefit of those who may desire assistance on problems involving matters pertaining to the operation or maintenance of air brakes, Diesel-electric locomotives, steam locomotive boilers or steam locomotive practice. Any inquiry should bear the name and address of the writer, whose identity will not be disclosed unless special permission is given to do so. Anonymous communications will not be considered. Inquiries should be addressed to this publication and they will be referred by the editors to the source from which an authoritative answer can be secured.

Diesel-Electric Locomotives

By J. R. Benedict

Transmission Fundamentals

Q.—Explain briefly the Diesel-electric fundamentals of the transmission of a Diesel road locomotive equipped with manual transition control.

A.—The purpose of the main generator in a Diesel-electric locomotive is to convert the mechanical horsepower developed in the Diesel engine into electrical power. The generator cannot put out more power than the engine is developing. The generator and traction motors are just an electrical transmission of the power that the Diesel is developing in its cylinders by burning fuel oil. The horsepower output of the Diesel engine and generator is controlled, and held to a fixed amount for each throttle position, by the action of the governor and load regulator. The power output of the engine and generator increases as the throttle is advanced, because more fuel is being injected into the cylinders. This power is measured in watts, which is the product of the voltage (pressure) times the amperage (current) of the generator. For example, 150 volts x 100 amperes = 15,000 watts.

The traction motors divide this power equally; if there are four motors attached to a generator, each motor gets one quarter of the power coming from the generator. This is true whether the motors are in series or parallel. The motors will draw a heavy current (amperage) when starting a train, or while running at slow speed. To keep from overheating the generator by drawing too much amperage from it when starting a train, the motors are "hooked up" in series. When motors are in series, the current from the generator flows through one after the other—the same current flows through all. This can be compared to a compound steam engine where the steam is used over again in succession in two cylinders. The current, or amperage, produces a powerful turning force, or torque, in the motors. This will start the wheels turning.

All motors develop back pressure (counter electromotive force) as their speed increases. Because the motors are in series, their combined back pressures buck the generator pressure, limiting the amount of current that can flow into the motors. Unless transition from series to parallel is made, the developed horsepower of the engine and generator will begin to drop off. This is due to the generator's having a limited pressure capacity, and if transition is not made the locomotive will not be able to take a train up to its rated speed. The motors are then "hooked up" in parallel by moving the engineer's transition lever. This allows the full generator pressure to be put upon each motor individually. This continues to force current into the motors, causing the train to increase speed. But when motors are in parallel, each motor has a direct source of current from the generator, and if the train speed should decrease due to a grade it is possible to overload the generator. When the speed of the train decreases due to a grade the motors are put back in series.

Care of Roller Bearings

Q.—Is it necessary to inspect roller-bearing journal boxes and housings daily?

A.—Roller-bearing journal boxes and housings should be inspected daily for oil leakage, damage

from striking objects on right-of-way, loose nuts and pipe plugs, and signs of abnormal heat. Running temperatures from 15 deg. to 50 deg. F. above the atmosphere temperatures are normal.

Q.—How often should the oil level in roller bearing journal boxes be checked and water drained from boxes?

A.—All water should be drained from the journal box and the oil level checked and necessary oil added every seven days. The locomotive should be allowed to stand for three hours before attempting to drain the water. The color of the oil should also be checked to determine if it contains water. Oil containing water has a muddy or yellow color, and causes rapid wear and bearing failure. When this condition is found the oil must be drained, the box cleaned with flushing oil or filtered Diesel fuel oil and new oil applied.

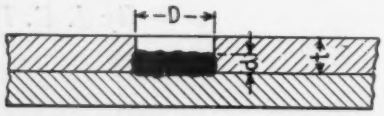
Steam Locomotive Practice

By George M. Davies

Plug Welds

Q.—A filler block was applied to the end of a guide yoke which was secured to the guide yoke with ten 1¼-in. diameter plug welds. The filler block was ½-in. thick and the guide yoke 1½ in. thick. What load could be carried by the filler block should the gear frame bolt be disconnected and the entire load carried by the plug welds?—K. A. C.

A.—A typical plug weld is illustrated in the accompanying sketch. The recommended design load as determined by test is as follows:



A typical plug weld

PLUG WELDS

Plate thickness, (t), in.	Dia. (D) of hole, in.	Depth (d) of plug, in.	Design load, lb. per sq. in.
¼	¾	¼	6,000
⅜	1	⅜	10,700
½	1⅛	7/16	13,500
⅝	1¼	½	16,700
¾	1⅜	9/16	20,200
1	1½	9/16	24,000

The above loads are based on a shear strength of 13,600 lb. per square inch of plug weld. The design load values given in the table are for one plug weld. Care must be taken that in combination with other plug welds or with other type of joints they are fairly well spaced and that the load distribution of the combination is taken into account.

Oil Separators

Q.—What methods are used for separating the oil from the exhaust steam of a locomotive where this steam is used for auxiliary heating purposes by mixing it with the water supply to the boiler?—M. E. F.

A.—Various types of oil separators are used. The most common separators are those using the helico-centrifugal principle. The helix, located near the inlet of the separator, gives the entering steam a whirling motion. Any oil or solid matter that is entrained in the exhaust steam is thrown to the outer wall of the separator where it collects and runs to the sediment pocket from which it drains to the ground.

Determining Tractive Force

Q.—What amount of the weight on the driving wheels can be safely assumed in determining the tractive force of a locomotive?—E. A. F.

A.—The rated tractive force of a locomotive is normally taken as the cylinder tractive force which does not take locomotive weight into consideration. It is determined by the following formula:

$$T = \frac{d^2 \times S \times .85\ P}{W}$$

Where:

T = Tractive force, lb.
d = Diameter of cylinder, in.
S = Length of stroke, in.
P = Boiler pressure, lb. per sq. in.
W = Diameter of driving wheels, in.

The ratio or factor of adhesion is the weight on driving wheels divided by the tractive force and is usually about 4. The weight on the driving wheels is a factor in determining the adhesion to the rails and therefore it has an influence on whether the cylinder tractive force can be used effectively or whether the locomotive is "slippery."

Lateral Motion Devices

Q.—Are lateral motion devices applied to the front drivers of a locomotive to enable it to negotiate the curves or to reduce flange wear? —R. A. K.

A.—The application of a lateral motive device to the front driving wheels of a road locomotive is gen-

erally to reduce the tire flange wear by providing additional lateral movement to relieve the flange pressure when negotiating curves. On switching locomotives they are often applied to enable the locomotive to negotiate sharper curves in addition to reducing flange wear.

Tank Water-Level Indicator

Q.—What is the principle of operation of an air-operated tank water-level indicator?

A.—There are various types of air-operated tank water-level indicators. The principle of operation is fundamentally the same for all types. The indicator or gauge in the cab is piped to within two inches of the bottom of the tank, the end of the pipe in the tank being left uncovered so that the pipe fills with water to the level of the water in the tank. A small source of continuous air supply is connected to the pipe. The air pressure inside the pipe builds up the pressure developed by the head of water in the pipe. This pressure, which is a measure of the volume of water in the tank, is transmitted to the indicator or gauge where, through a bellows and suitable linkage, it actuates the indicator pointer. The excess pressure in the air line escapes through the water and out to the tank vent. The pressure developed in the pipe varies directly with the height of water in the tank.

Steam Locomotive Boilers

By George M. Davies

Torch Backfire

Q.—In handling oxy-acetylene equipment what is the cause of backfiring in the torch? —R. E. L.

A.—This reaction may be either a backfire or a flashback. A backfire is a momentary extinguishment or momentary burning back of the flame into the torch tip. It is caused by touching the tip against the work, by particles entering the tip and obstructing the gas flow, or by overheating the tip. Sometimes the trouble will clear itself immediately and, if the work is hot enough, the torch will relight automatically.

A flashback is the burning back of the flame into the tip of the torch or the ignition of an explosive mixture in one of the gas lines. A flashback can and often does burn right back into the hose. The danger in the case of a flashback can be practically eliminated by understanding immediately what it is, what it does and what steps may be taken to remedy it. In case of a flashback, first put out the fire by closing first the torch oxygen valve and then the torch acetylene valve. Then wait a few moments to be sure the fire in the torch or hose has a chance to burn out. Flashbacks can be caused by improper pressures, distorted or loose tips or mixer seats, kinked hose, clogged tip or torch orifices or overheated tip or torch.

Number of Patch Rivets

Q.—How can the number of rivets required for a diamond-shaped patch, for a given defect, be determined?—E. V. D.

A.—The number of rivets required to ensure a rivet efficiency at least 16 per cent greater than plate efficiency is found from the following formulae:

$$\text{Number of rivets} = \frac{\text{Value of metal lost}}{\text{Shear strength of one rivet}} \times 1.1$$

or

$$N = \frac{L \times t \times S_t}{D \times .7854 \times S_s} \times 1.1$$

Where

N = Number of rivets required above and below crack

t = Thickness of shell plate, in.

L = Length of crack, in.

D = Driven diameter of rivet or root of thread on patch bolt, in.

S_t = Tensile strength of shell plate, lb. per sq. in. (50,000 for carbon steel if actual tensile strength is not known.)

S_s = Shear strength of rivet, lb. per sq. in. (44,000 for steel rivets.)

Example: Calculate the number of rivets required above and below a crack 8 in. long in a carbon steel shell 7/8 in. thick, having driven rivets of 1 3/16-in. diameter.

Then $L = 8$ in. $\quad t = 7/8$ in. $\quad D = 1\,3/16$ in. $\quad S_t = 50{,}000 \quad S_s = 44{,}000$

$$N = \frac{8 \times .875 \times 50{,}000}{1.18752 \times .7854 \times 44{,}000} \times 1.1$$

$$N = \frac{350{,}000}{48731} \times 1.1 = 7.89 \text{ or } 8 \text{ rivets}$$

Welding Galvanized Steel

Q.—Is it practical to fabricate galvanized steel tank valve strainers by welding? The strainers would be made with one vertical and one circumferential seam weld.—R. E. V.

A.—The welding of corrosion-resistant metals such as galvanized steel, which is a steel coated with zinc, is practical. Experience and investigations indicate that welding galvanized steel affects the strength or corrosion-resistant qualities much less than commonly thought. For all practical purposes its effect is negligible, the reason for this is the fact that the zone

from which the coating or galvanizing appears to have been removed by the heat of the arc has little reduction in its corrosion-resistant properties. It is, of course, obvious that the heat of the arc will melt the zinc, and that some of the zinc goes off in fumes, a greater removal being next to the bead. But even this very small or narrow zone of what appears to be complete removal of the zinc, is not attacked as much as a non-galvanized steel. In the zone where the zinc is melted, and this zone may occur at some distance from the bead, the protection is not reduced. The extent of this zone depends upon the thickness of the plate and the current used. In the case of a tank well strainer using ⅛ inch steel and single bead welding the effect of the weld upon the galvanized would be negligible.

Schedule 24RL Air Brakes

Service Lap Position

Q-807—Describe this position at the brake valve. A.—When the pressure in the equalizing reservoir and chamber *D* is reduced the desired amount, the brake valve handle is moved to Lap position, thus stopping any further flow of equalizing reservoir pressure to atmosphere. As rotary valve *216* connects passage *16* to the exhaust passage in Lap position, air continues to discharge from the brake pipe until the pressure has fallen slightly lower than that retained in chamber *D*, permitting the pressure in this and the equalizing reservoir to move the equalizing piston to the right. The short end of lever *79* is rotated upward with the piston movement, thus allowing spring *83* to close the equalizing discharge valve as the piston moves to the right.

Q-808—Does this piston movement vary? A.—Yes. As the piston movement is influenced by the rate at which the brake pipe pressure is reduced, the valve will close more slowly with a long train.

Q-809—What determines the amount of brake pipe reduction? A.—The reduction of equalizing reservoir pressure, regardless of the train length.

Q-810—What is the purpose of this gradual stoppage of brake pipe discharge? A.—To prevent brake pipe pressure at the head end from being built up by air flowing from the rear, which action might cause some of the head brakes to kick off.

Q-811—Describe lap position at the D-24 Control Valve. A.—The auxiliary reservoir pressure is reduced slightly below the brake pipe pressure by flowing to the displacement reservoir. Thus the service piston and graduating valve move to the left until the piston stem shoulder engages the slide valve, in which position the graduating valve blanks the service port *n* to cavity *D* in the slide valve and cuts off further flow of auxiliary reservoir air to passage *3c* and the displacement reservoir.

Automatic Service Position

Q812—What is the position of the release piston? A.—The release piston and its slide valve remain in service position, holding exhaust passage closed and the brake applied.

Q-813—What action takes place in the emergency portion in Lap position? A.—When the brake pipes pressure becomes slightly higher than that in the quick action chamber the emergency piston and graduating valve are moved to the right until the shoulder on the piston engages the slide valve. This movement opens the charging choke *22* between brake pipe and quick action chamber. The graduating valve blanks the vent port *v* in the slide valve, preventing further reduction of quick action chamber pressure.

Release and Recharge after Service Application—

Q-814—Describe the action in this position. A.—During a service application, the emergency reservoir remains at the pressure charged previous to the application. When the brake valve handle is placed in release or running position, the higher pressure on the brake pipe face of the service piston forces the piston to release position.

Q-815—What then takes place? A.—Port *13* is disconnected from cavity *A* and the exhaust port *At*, and connected to the auxiliary reservoir in the slide valve chamber through port *E* in the slide valve. Auxiliary reservoir pressure is thus present on both sides of the release piston. The piston spring then moves the piston to the right, the slide valve cavity connecting the displacement reservoir passage *3a* to the exhaust passage *10*. Port *19* is connected to port *B* in the graduating valve, thus emergency air from pipe *2* (in direct release) can flow through spill over plug choke *5*, passage *19* and port *B* into chamber *C* to connect emergency reservoir and auxiliary reservoir air.

Q-816—What serves to prevent an overcharge as might occur in cycling operation? A.—Direct release recharge choke *5* provides for this method.

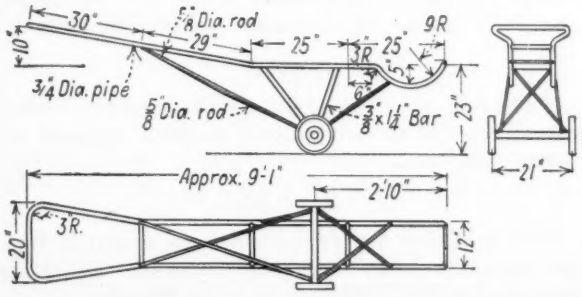
Q-817—What is the advantage of keeping the emergency reservoir pressure down? A.—This provides a spillover for the quick action chamber.

Q-818—Is there a possibility that charging the auxiliary reservoir from the emergency reservoir may result in moving the service piston to service position? A.—This is prevented by the graduating valve blanking port *19* at the initial movement toward service position, which cuts off the flow of emergency reservoir air before the service piston can pick up the slide valve and move it to service.

CAR INSPECTION AND REPAIR

Dolly for Applying Air Brake Equipment

A two-wheeled dolly for carrying and supporting AB cylinders, valves and reservoirs during their application to the car has been constructed by the shop forces at the Illinois Central car shops at Centralia, Ill. The cart has a long handle on one end,



Construction details of the lifting dolly for air brake parts

while the other, or load-carrying, end is formed so that the parts may be rolled directly onto the cart where they are held in place for moving by the concave shape of this end. In hanging cylinders and valves the part is held against the top holding bracket for lining up, inserting and tightening the holding bolts. When applying the reservoir the dolly is maneuvered to place the reservoir holding brackets in place over the car bracket.

Lifting dolly for carrying and hanging air brake parts

The cart is made up of 3/4-in. pipe, 5/8-in. rod, and bar stock 3/8 in. by 1 1/4 in. It is of all welded construction with an overall length of about 9 ft., a maximum width of a little over 21 in., and steel wheels 10 in. in diameter.

Straightening Car Sides and Ends

Two devices which expedite freight-car work at the San Bernardino, Calif., car shops of the Atchison, Topeka & Santa Fe, are shown in the illustrations. The first, used for straightening car sides, consists of a 15-in. I-beam, 15 ft. long, set in concrete and connected by chain at the top to a similar beam on the other side of the car. Each of these beams is positioned 6 ft. 2 in. from the near rail and used, with suitable blocking and a jack, to straighten car sides. If necessary, heat may be used, although generally not required. In case the jacking operation is relatively heavy, the opposite side of the car may have to be blocked to prevent rocking. Also dependent

Car side straightening device used at the San Bernardino shops of the Santa Fe

Portable device used in straightening bulged car ends and adjusting shifted loads

upon the nature of the bend, blocking inside of the car may be necessary.

A companion piece of equipment is a three-wheel truck equipped with a 16-ft. boom made of four 2½-in. angles, used for straightening bulged car ends. The larger wheels were taken from a baggage truck and applied to an A-frame which supports the boom by steel cable connection to a ratchet and drum with 12-in. handle. With this device chained to the car end and the boom adjusted to the proper height, operation of a Simplex jack at the lower end of the boom exerts sufficient pressure to straighten the car ends quickly and with relative ease. This device is also used for adjusting loads on open top cars which have become shifted in transit.

Changes in the 1949 Interchange Rules*

Freight Car Rules (continued)

Rule 18

Sec. (c) Par. (1-a)—Modified by changing condemning limit in knuckle side wall of coupler from 10 to 15 in., and providing that when cracks extend beyond the shaded area the coupler body is condemned and must not be reclaimed by welding. Figure D revised to conform with Fig. 9 of Rule 23. This change removes conflict in condemning and reclamation rules.

Rule 19

New Item 21 added to prohibit application of non-A.A.R. Standard journal box lids.

Rule 20

New note added to Fig. 3 to provide an alternate design of coupler shim which can be more readily applied.

Rule 23

Sec. B—New note added following third item, "Bolsters, Cast Steel' and following 51st item, "Truck Sides, Cast Steel" advising welding practices permitted are confined to castings of Grade B Steel. Thirtieth item, "Hand Brakes, Geared" modified to indicate parts of the hand brake that may or may not be welded.

Rule 30

Sec. B Par. (1)—Third item revised to include first and subsequent reweighing periods for type "LO" covered hopper cars.

Rule 32

Interpretation No. (1)—Modified by addition of words "or other parts of car" to clarify intent car owner is responsible, providing no other Rule 32 condition involved, for damage caused by passing over other parts of car as well for such damage caused by passing over coupler, as shown in Supplement No. 1.

Interpretation No. (8)—Modified by addition of words, "except as provided in Rule 33", in answer to clarify intent and eliminate conflict with Rule 33.

Rule 36

Note following Par. (13), with respect to defect cards printed in red ink, eliminated account no longer necessary.

Rule 60

Interpretation No. (4)—Added, as shown in Supplement No. 1, to definitely determine expiration date for periodic C.O.T. & S. of air brakes.

Rule 66

Par. (g) (2)—New last sentence added providing penalty for failure to repack all boxes, as shown in Supplement No. 1, and stencil car, when old packing date is between nine and fourteen months and wheels changed or other work performed, which necessitates removal of packing from four or more boxes.

Interpretation No. (5)—New added, as shown in Supplement No. 1, setting up basis of determining expiration date for periodic repacking of boxes.

Rule 66-A

New rule added to provide for periodic inspection and lubrication of freight car journal roller bearing units. Full compliance with these requirements is important. Also new note added providing for use of grease approved by roller bearing manufacturers until A.A.R. specification for roller bearing grease is adopted.

Rule 70

Sec. (a)—The first five paragraphs in former rule, covering substitution of wheels, have been consolidated into a table, which specifies whether or not the substitution constitutes improper repairs. No change made in principle, except to revise former paragraph (5) to permit substitution of cast steel wheels for

* An interpretation of the A.A.R. Rules of Interchange effective January 1, 1949, presented at a meeting of the Car Foremen's Association of Chicago, by R. W. Hollon, mechanical inspector, Chicago, Burlington & Quincy.

cast iron wheels as proper repairs. The second hand value of cast steel wheels is based on second hand value of cast iron wheels per Note following item 193 of Rule 101. Former three paragraphs (d) (1), (2) and (3), pertaining to substitution of M.W.W. steel wheels for cast iron or 1-WW steel wheels standard to car and substitution of 1-W.W. Steel Wheels for cast iron wheels standard to car, account owner's responsibility, and charges permissible for such substitution, consolidated in new paragraph (d), for easier reference.

Par. (f)—Modified to provide charge, in case of exchange of wheels account handling line responsibility, on basis of second hand value of 1-W.W. steel wheels when multiple wear, 1-W or 1-WT wrot steel wheels are substituted for each other and on basis of second hand value of cast iron wheels when steel wheels are substituted for cast iron wheels standard to car, except when substitution is made in accordance with stenciling "New Std" per Rule 16, full charge for wheels applied is permissible.

Interpretation No. 1—Modified to clarify intent charge for steel wheels applied to a car not stenciled to indicate steel wheels standard to car, must not exceed new value of cast iron wheels in case of owners defects, or second hand value of cast iron wheels in case of handling line defects.

Rule 83

This rule eliminated, as shown in Supplement No. 1, because Rule 3 prohibits interchange of cars equipped with double plate cast iron wheels. Also wheel symbols, on page 170, modified accordingly.

Rule 84

Modified to clarify intent that delivering line responsibility for cut or damaged journals applies only to friction bearing units, and that responsibility for failure of roller bearing units is governed by conditions specified in Rule 85.

Rule 85

New second paragraph added which makes car owner responsible for failure of roller bearing units, except when they occur, due to defects or overheating, when stenciling indicates periodic lubrication date is more than 12 months old, no date on car, or date illegible.

Rule 86

Table on Page 174, covering "Standard Axles, Limits of Wear and Dimensions, New", and first two notes following revised, as shown in Supplement No. 1, to conform to similar table in Wheel and Axle Manual. Limits of wear at center of axle (column K) revised, effective January 1, 1949, to allow same limits of wear which were in effect prior to August 1, 1948. Care must be taken to avoid scrapping axles unless worn beyond the new limits specified.

Rule 87

Interpretation No. (1)—Modified to clarify intent splicing of refrigerator car sheating constitutes temporary repairs, same as for box cars, and for which no charge is permissible or defect card due in case of owner's defects; in case of handling line responsibility issue defect card for labor and material to standardize repairs.

Rule 88

Interpretation No. (6)—This was formerly Interpretation No. (8) in Rule 101, advising that application of wrong size cross rod or draft spring to Cardwell friction draft gear constitutes wrong repairs, and is transferred to Rule 88 for easier reference.

Interpretation No. (7)—New added to provide charges and credits when substituting a friction draft gear and AAR Standard yoke for a missing Waughmat Twin Cushion gear and yoke. If non-approved friction draft gear applied, charge on basis of scrap value at ½c per pound, yoke to be charged on basis of new or second hand value per Rules 101 and 104; if approved friction gear applied, charge on basis of new or second value, per Rule 101 as specified in Rule 17, Section (i).

Rule 91

Sec. (b) and (c) modified, as shown in Supplement No. 1, to prescribe time limit for taking exceptions to charges in car repair bills and to expedite payment of such bills.

Rule 93

Third paragraph modified to require separate statement in bill for periodic lubrication of journal roller bearing units.

Rule 95

Third paragraph, with respect to missing draft gears, modified by elimination of word "Friction".

Par. (c-2) modified, as shown in Supplement No. 1, with respect to scrapping at expense of car owner, except as provided in Rule 68 and in case of wheel broken in derailment, cast iron wheels of double plate design, wheel without weight cast thereon or below nominal weight. Repair cards must show "D.P.", "No Cast Weight", or "Below Nominal Weight" to justify scrap credit.

Sec. (i) Par. (1)—Allowances for service metal on one-wear wrot steel wheels reclaimed by turning, increased to conform to current prices.

Interpretation (4)—Second note modified, as shown in Supplement No. 1, by eliminating reference to double plate cast iron wheels, as such wheels are prohibited in interchange.

Rule 101

Material prices modified in accordance with current price quotations. This rule has been completely revised for the purpose of simplification by eliminating obsolete items, necessary modification of other items to bring them in line with present day standards of car equipment, consolidating and grouping of items directly related, inclusion of Piece No. reference for air brake details and charge and credit columns for these items. New items and notes added. The changes are too numerous to report in detail, however particular attention is directed to the following items:

Items 46 and 47—New notes added which specify charge for service and emergency portions damaged

by fire when renewed on authority of defect card and require brakes be C.O.T.&S. at the same time to justify charge.

Item 54—New added to provide charge for release valve complete, also new note added which requires piece numbers on repair card when separate parts are renewed.

Items 104 to 105-B Box Lids—Former items 104 and 105 eliminated account these lids of obsolete design. Former item 104-B renumbered 104 and material portion of allowance penalized 50 per cent of price new. Item 104-B modified to indicate January 1, 1936 specifications and material portion of allowance for all sizes; except 12 inch, penalized 25 per cent of price new. New items 104-C, 104-D, 105-A and 105-B added to provide allowances for box lids per current A.A.R. 1947 Specifications. Former item 105-A renumbered 105 and modified to indicate per January 1, 1936 specifications and material portion of allowance for 8, 9 and 10 inch sizes penalized 25 per cent of price new.

Item 152—New second note added to provide basis of charge for doors of obsolete design for which allowances are not specified.

Item 169-J—New added to provide charge for periodic lubrication of roller bearing units.

Rule 104

Sec. (i)—New item 7-A covering coupler yoke back filler when applied second hand must be charged at 50 per cent of value new.

Rule 107

This rule completely revised and rearranged by eliminating obsolete items and modifying others, similar to revision of Rule 101. New item 1 provides that charges for items of wood car repairs not included in current Code of Rules shall be in accordance with allowances specified in the 1948 Code of Rules, therefore the 1948 Code and Supplement No. 1 thereto must be retained to obtain these charges when necessary. A number of items have been modified, some as shown in Supplement No. 1, and relocated for easier reference.

Rule 111

Item 15—Allowance for C.O.T.&S. of AB and AB-1-B air brakes increased.

Item 15-A—Modified to include the cleaning, lubricating and repairing of the selector and safety valves of the AB-1-B brakes equipment.

Item 15-B—New added to provide charge for cleaning, lubricating and repairing quick service valves, types A-s or A-2-A, either separately or in connection with Item 15-A.

Item 15-C—New item added to provide charge for cleaning and repairing signal valve either separately or in connection with Item 15.

Cleaning and repairing of quick service valves and signal valves must be recorded as separate items on billing repair cards.

Rule 112

Sec. B—Per pound prices in tables following paragraphs 1 and 8 modified, as shown in Supplement No. 1. New last sentence added to Par. 3 pertaining to settlement of destroyed cars on reproduction cost basis when the applicable cost factor covering period in which car is destroyed has not been published.

Sec. J—Modified, as shown in Supplement No. 1, to include metal drop end gates, steel side and end doors, if in serviceable condition, among other items, car owner may request return of from destroyed cars.

Rule 120

Sec. (g)—Second paragraph modified to include metal drop end gates, steel side and end doors, if in serviceable condition, as items car owner may request return of from cars dismantled on foreign roads, as shown in Supplement No. 1.

Rule 122

Interpretation 7—Modified to include Waughmat Twin Cushion draft gears and yokes as material repairing line must furnish unless substitutions are made as authorized in Rule 17.

Interpretation 8—Modified to clarify intent with respect to furnishing parts made of high tensile steel.

Passenger Car Rules

Rule 2

Sec. (e) and (f)—Effective dates with respect to application of cardboards or receptacles for defect cards and application of brake shoe spark shields extended to January 1, 1950.

Rule 7

Sec. (e) Par. 4—Modified to provide handling line responsibility for failure of roller bearing units due to overheating when stenciling on car indicates periodic lubrication is 15 or more days over date. Reports covering such failures should show last stencil date.

Sec. (f) Par. 13—Second Note—Effective date extended to January 1, 1950, with respect to penalty for substitution of untreated for heat treated wheels.

Sec. (h) Par. (1-a)—Modified by changing condemning limit of cracks in knuckle side wall of couplers from 10 to 15 inches, as shown in freight car Rule 18.

Sec. (1)—New second paragraph added to provide for periodic lubrication of journal roller bearing units, stenciling and billing therefor.

Table, Page 327, covering A.A.R. 1940—design passenger car axles modified, as shown in Supplement No. 1, to conform to similar table in Wheel and Axle Manual, and dimensions of wear limits of center diameter modified to those in effect prior to August 1, 1948.

Table, Page 328 covering tubular axle—Modified, as shown in Supplement No. 1, to conform to similar table in Wheel and Axle Manual.

Rule 8

Interpretation (1)—Modified to provide disposition of buffer details removed from passenger equipment cars, as shown in Supplement No. 1.

Rule 10

Item 2—Modified by including periodic lubrication of roller bearing units as an exception, thus making such expense owner's responsibility.

RULE 13

Sec. (b)—Sixth item modified to exclude periodic lubrication of journal roller bearing units, as an item for which no labor or material may be charged.

RULE 18

Second Note—New last sentence added to provide for settlement of destroyed passenger cars when cost factor covering period in which destroyed has not been published.

RULE 21

New items 20-L and 20-M added to provide charge for quick service valves, types A-2 or A-2-A and signal valves, cleaned, repaired and lubricated, whether or not in connection with periodic attention to air brakes. Repair card must show these items separately from C.O.T.&S. of brakes.

First note following item 27, modified to coincide with item 168 of Freight Rule 107.

RULE 22

Item 21-A—New added to provide charge for periodic lubrication of journal roller bearing units.

Item 41-(a) Notes 1 and 2—Modified, as shown in Supplement No. 1, with respect to charges and credits for steam connectors.

Note 4—Added, as shown in Supplement No. 1, to clarify intent charge can not be made for both terminal heating and precooling for same departure of car.

Device for Magnaflux Testing of Couplers

A relatively simple device which helps greatly in the Magnaflux testing of couplers at the San Bernardino, Cal., shops of the Santa Fe is shown in the illustration. It consists simply of a welded steel frame with two rotating heads between which the coupler is secured (after the Magnaflux coil has been applied) and easily rotated by hand dependant upon which side of the coupler head or shank is to be inspected. The rotating head at the left is mounted on a small air cylinder piston which enables it to be withdrawn when necessary to change couplers.

Easily rotated coupler support used in Magnaflux testing

A well-shaded spot light gives excellent illumination directly on the coupler side which is being inspected where a light sprinkling of Magnaflux powder immediately shows up any small crack or flaw in the steel liable to progress in size and cause failure.

The particular advantage of this device is that it brings the coupler inspection up to a level which is most convenient from a visibility standpoint and then the coupler may be easily revolved and inspected in a fraction of the time formerly required.

A.W.S. Forum On Welding Practices*

Q.—I would like to know how you can fit up sides on the side of a freight car to a ¾ in. cambered sill? How can you put the side in straight? The railroad company calls for certain cambers in your center sill, and yet you have a line of holes to fit. It just doesn't make sense to me. I know an answer to it but it isn't quite a legal way to do it.

A.—The camber is put in the A.A.R. center sills according to the weight of the car so that when the weight of the car is deposited on the sill it would straighten itself out.

It is a very desirable situation but we find in practice that they don't come out straight.

Q.—I would like to discuss another topic—that of requiring that castings, such as side frames, couplers, and yokes, be normalized after welding of cracks. Is normalizing necessary to the successful operation of such a welded part?

A.—I believe that what is more important than normalizing would be to get a good quality of weld. If the weld quality is poor I don't believe that any normalizing or stress-relieving treatment would improve the job.

Stress-relieving, I think, is primarily a question of analysis of material. If we have a low carbon or low manganese steel, the only reason that I would stress-relieve it is when a lot of machining must be done. I believe I could build a Diesel engine block without stress-relieving and the only reason we stress-relieve is because of machinability. In a block, for instance, the normal practice is to take two cuts out of the bores, and if you took five cuts and it took gradually all the way through, and your stresses were all balanced right, I do not think you would have to stress-relieve, but it would not be economical. So it is more economical to stress-relieve and do fewer cuts. Therefore, if you know the analysis of your steel, you can repair and salvage steel cast-

* A continuation of an abstract of the discussion at an open meeting of the Railroad Welding Committee, American Welding Society, on October 26, 1948, at Philadelphia, Pa. The first installment appeared in the January, 1949, issue. This installment concludes the discussion on freight car welding.

ings or weld ordinary steel without stress-relieving and do even quite a lot of welding on it, provided you haven't got machining to worry about.

Q.—As I understand, Rule 23 calls for not stress-relieving but normalizing to 1,500 or 1,600 deg. F., whereas stress-relieving I believe is at 1,100 deg. F. What would you say about normalizing?

A.—I think that when you go beyond the critical range, that is generally classified more as annealing. In other words, you change the grain structure. In general practice that only comes into the question when you have materials above the point 35 per cent carbon range, in which there is a definite effect on grain structure due to the welding. That is the only time you have got to bring an annealing operation into the picture. All others can be stress-relieving; just relieve stresses instead of changing the grain structure.

I am inclined to think, myself, that normalizing some of the castings is very beneficial, but it would be beneficial regardless of whether the casting was welded or not. What I would like to develop here is the opinion about the actual necessity for that normalizing treatment after the welding.

I looked into the thing at one time because some steel castings were breaking for which there seemed to be no particular reason. Someone had done some welding repairs on it. I tackled it from the angle of impact value and found, taking the tensile piece out of it—that is, pieces that were not normalized or stress-relieved after you had done some welding—that you still got favorable test results. But when you made an impact test, the izod ran down to five or six foot-pounds for the same material. Normalizing the same material, at 1,150 deg. heat seemed to do a good job. In freight car equipment particularly, which is subject to the stresses and bang-arounds that we have, it is well warranted to put it through a normalizing or stress-relieving operation.

Q.—Which heat treatment did you refer to?

A.—Normalizing, of course, is mandatory. In this particular case carbon ran about point 20 to 22. Your izod values were comparable, whether it was heated to the 1,150 or the 1,650 deg. F. Either one apparently would do the job. It is quite a research problem that someone might dig into.

Q.—There is one more problem which involves Rule 22 in the A.A.R. interchange rules, and that is the matter of applying splice plates where a side sill or center sill has been broken. The rule requires that a relatively long splice plate, three feet or so, be applied to that part. What is your opinion about that requirement?

A.—I think that the splice plate could be eliminated, because if the welding is done the way it is supposed to be, that plate could be removed.

Q.—In side sills we weld ½-in. material together and put a plate under it, and we go into the engine-house and weld a locomotive frame that is 5 in. by 8 in. with a butt weld. How about that?

A.—In butt joints, one of the problems is that you are liable to have a concentration of stress due to the contraction of weld. The smallest crack might produce a complete failure. It isn't a question of making a sound weld but it's a question of a stress causing a crack, particularly in butt joints.

Summary

We have often mentioned Rule 23 in the discussion of freight cars. Rule 23 is the bible that railroad repair people have to live with to maintain their cars. The rule in the past has been pretty restrictive.

It is the purpose of the A.A.R. to begin to make this rule permissive, and in doing so there are certain obstacles that have got to be overcome. The railroads have got to be the leaders in giving the A.A.R. something to look at to prove that they are in a position today to lift some of these restrictions.

One of the big holdbacks is that today our freight car equipment is entirely new in most railroads. We have gone through a period where there was a lot of old equipment that didn't warrant repairing, and we are beginning to see new equipment with the majority of it being pretty near 100 per cent welded. We would be able to perform a satisfactory repair job on these if we could get them into a modern welding shop, but there are some outlying shops where they didn't know where to start and stop.

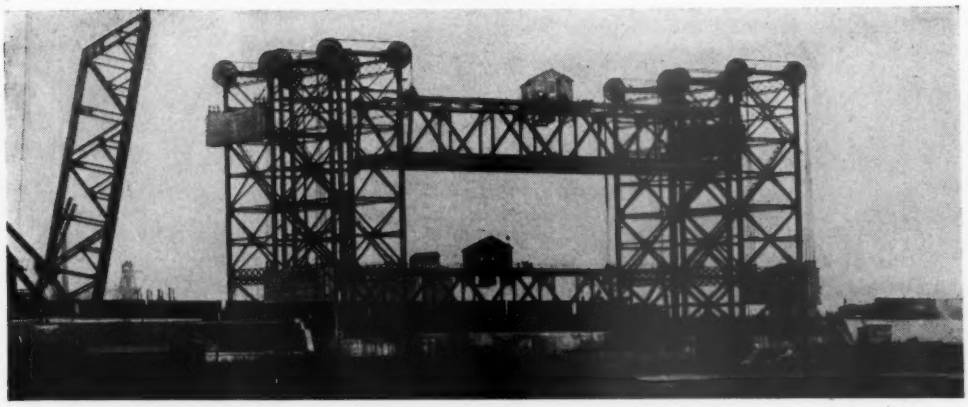
The first thing we have got to do is to sell management on the fact that welding is here to stay. We have got to have the equipment; we have got to have the materials and the personnel that is going to have the know-how to do it. There is only one right way to do that on most major railroads, and that is to head welding up under one man who is going to keep abreast of what is going on. Depending on the size of the railroad, that information has got to be put out in the field.

The second step is to educate engineering people. We sometimes have a major repair operation on a welded car. Draftsmen prepare drawings but they do not always appreciate what is involved in trying to make a weld repair. They don't see how you are going to get at it to make these welds, how you are going to make a 100 per cent weld. Taking the riveted car and simply doing some welding on it is out. You've got to get engineering people educated to the welded design.

The next step is to qualify the men on the job that are actually doing the work. At those outlying points those are the fellows who have got to be watched because they are not doing welding every day. We have also got to furnish the outlying points with proper equipment. We give him some broken-down equipment and expect him to do a decent job. Again, it is up to welding supervision to sell management the idea that they have got to have the equipment to be able to do a job.

Then there is a final checkup. There are many welding jobs done that we think are adequate at the time—there is a question about that. We have got to know the results. It is up to welding supervision on the railroad to take what steps it can to allow Rule 23 to be eliminated—that is, to take the restrictions out of it, to get it to the point where qualified welders with the equipment and the materials to do a job, can really go out and do welding for the railroads comparable to that which is required of builders in building the cars.

ELECTRICAL SECTION



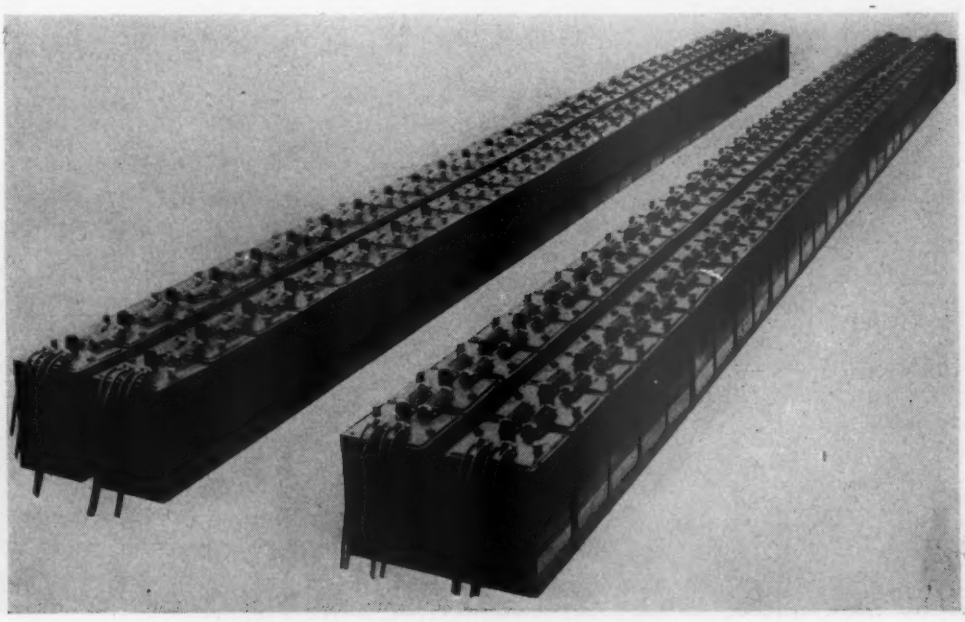
The Pennsylvania's battery-operated bridge at East 96th street, Chicago

Battery Avoids High Power Load Peak

To supply an inexpensive source of peak power, the Pennsylvania Railroad employs a 240-volt battery for raising its East 96th Street bridge in Chicago. Peak demand is so far above normal that the battery installation is less costly than utility rates based on actual electrical consumption and peak demand. As many as 30 bridge raisings per 24 hours, each lasting about six minutes and drawing an average of 400 amp., not including the break-away power surge, are powered by the battery. Each of the twin spans is 217 ft. long and must be raised a vertical distance of 98 ft.

To supply this energy, a new installation of 120 Gould rubber-jar cells was recently put into operation to replace a previous Gould battery, transferred to supply power for another bridge. Each 29-plate cell has a capacity of 1,680 amp.-hr. at the 8-hr. rate of discharge. The 51,000 lb. installation rests on rubber- and wood-strip insulators supported on an elevated concrete floor.

The battery is charged by a 10-kw. motor generator set. The float method of charging is used, with 2.15 volts per cell or 258 volts for the entire 120-cell battery. The current supplied to the battery during charge will vary according to the state of discharge of the battery, and will range from 0.5 to 30 amp.



The 120-cell battery— The load demand for lifting the bridge is about 50 kw. — The maximum charging demand is less than 10 kw.

Virginian Electrics Meet Performance Requirements

*By Jack Hause**

Motor-generator type locomotives operate in same train with constant-speed units and also serve to improve time freight schedules

FOUR motor-generator type electric locomotives have now been in service on the Virginian for more than a year. They were purchased to handle increases in both coal traffic and manifest freight, and also, to allow for the making of class repairs on some of the original locomotives, which have now been in service for 24 years.

The locomotives were designed and built to meet the railroad's functional specifications, and were delivered by the General Electric Company early in 1948. Additions are also being made to the railroad's power plant at Narrows, Va., to meet the increasing demand for power.

The original locomotives are of the split-phase type using induction motors and having running speeds of 14 and 28 m.p.h. Acceleration to these speeds is accomplished by means of water rheostats connected to the wound rotors of the traction motors.

The new locomotives are variable-speed units, changes in speed and power output being accomplished by controlling the field of the main generator. In spite of these basically different characteristics, the old and the new locomotives are used together for hauling 6,000-ton trains up the Virginian's 14-mile, 2 per cent grade.

A profile of the electrified section is shown in one of the illustrations. The major movement of loads is eastbound, with empties moving westbound. Normally, two locomotives (one head-end and one pusher) take a 6,000-ton train from Mullens to Clarks Gap. Here the train is filled out to 9,000 tons

*Locomotive & Car Equipment Divisions, General Electric Co.

The Virginian's power plant at Narrows, Va.

A motor-generator type locomotive at the front and an induction-motor type locomotive at the rear of a 6,000-ton train

and taken from Clarks Gap to Roanoke by one locomotive. Empties are moved westbound in 3,000-ton trains by one locomotive from Roanoke to Mullens.

When used alone, the new locomotives can be operated over some sections of the line at speeds up to 35 m.p.h. Intermediate speeds between 14 and 28 m.p.h. are also made possible by flexible control and high regenerative braking capacity. In some cases, trains are brought to a complete stop by means of regenerative braking alone.

In the movement of tonnage trains, speed is not the controlling factor, but in the case of time freights where road speed is of more importance, the new locomotives can effect a reduction in running time over the electrified section of one hour and twenty minutes, including all time required for meets and operating delays incidental to regular performance.

Inspection requirements are simple and the locomotives can be turned in fifteen minutes. When necessary, a complete truck can be changed-out at a terminal in one and one-half hours. Sand is used only for starting on heavy grades, and the weight compensating feature, which allows for weight shift on the two axles of a truck during acceleration, is seldom used.

The motor of the motor-generator set functions as a synchronous condenser, and under conditions of regular operation, the new locomotives effect an improvement of 10 to 15 per cent in system power factor, and an increase of contact line voltage.

Average mileage for all electric locomotives is about 60,000 per year. Approximately 25 per cent of power used for hauling trains is returned to the line by generation.

The New Locomotives

The new locomotives are streamlined for pleasing appearance and are of the most modern design. Special attention was given in design to use standard items of apparatus where possible. The outstanding item of this nature *is* the traction motor which is a duplicate of those in widespread use on large Diesel-electric road locomotives. The proper application of such standardized items results in lower costs and better service to the railroads.

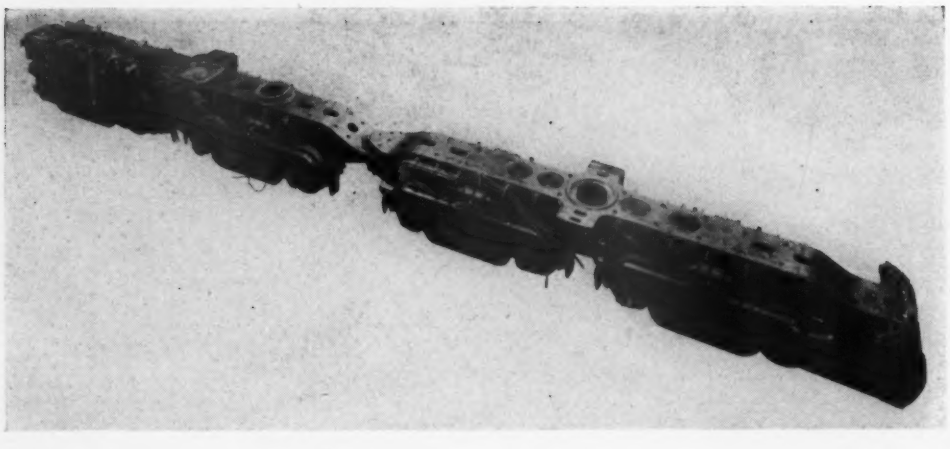
Each locomotive consists of two cabs and each cab is mounted on four two-axle swivel trucks (a total of eight trucks for each locomotive). The two halves of the locomotive are exact duplicates, and are permanently connected at the inside ends. A vestibuled walkway provides easy passage between cabs.

The locomotives operate under an overhead contact system, taking a.c. energy at 11,000 volts, single phase, 25 cycles.

This a.c. power is converted to d.c. power on the locomotives by stepdown transformers and synchronous motor-generator sets. The d.c. power is distributed to 16 series-wound, axle-hung traction motors geared to the driving axles by single-reduction gearing.

The locomotives have two control positions and are arranged for full operation from either end.

Arrangement is made for regenerative braking using the traction motors as generators. Thus, dur-



Running-gear assembly of one cab

ing electric braking, the locomotives feed energy back through the motor-generator sets and transformers to the contact system.

A summary of dimensions and characteristics is shown in Table I.

The locomotive cabs and cab underframes are fabricated from steel sheets, plates, and shapes by welding. The weight of the cabs and included apparatus is carried through the center sills and span bolsters to the truck center plates. There are no loading pads.

Each cab is divided into three principal sections—the nose compartment, the operator's compartment and the apparatus compartment.

The apparatus compartment has hatchways in the roof for removal of major equipment items for repair and maintenance purposes. The nose compartment has a removable plate, fitted and bolted to the outside front end for the same purpose.

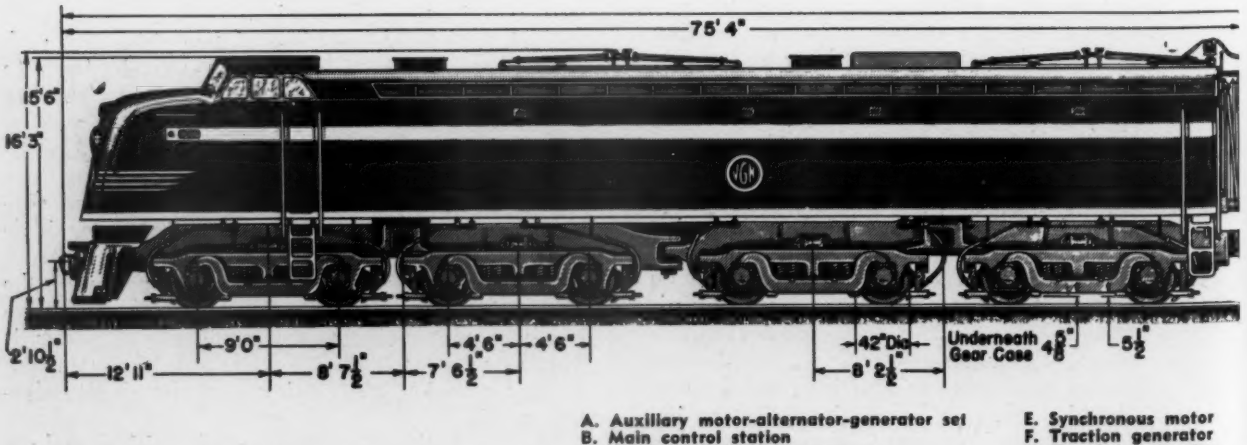
The nose is re-enforced with collision posts for protection to the crew and equipment in the event of collisions.

Each cab is carried on two cast-steel span bolsters, each of which is carried on the center plates of two cast-steel trucks. There are four span bolsters and eight two-axle trucks per locomotive. The two outside end-span bolsters carry draft rigging and pilots on their outer ends. They are connected to the inside span bolsters, under the center of each cab by pin and ball-and-socket articulation joints. The two inside-end span bolsters are connected between cabs by a solid steel draw-bar and radial buffer.

One span bolster under each cab has a fixed center

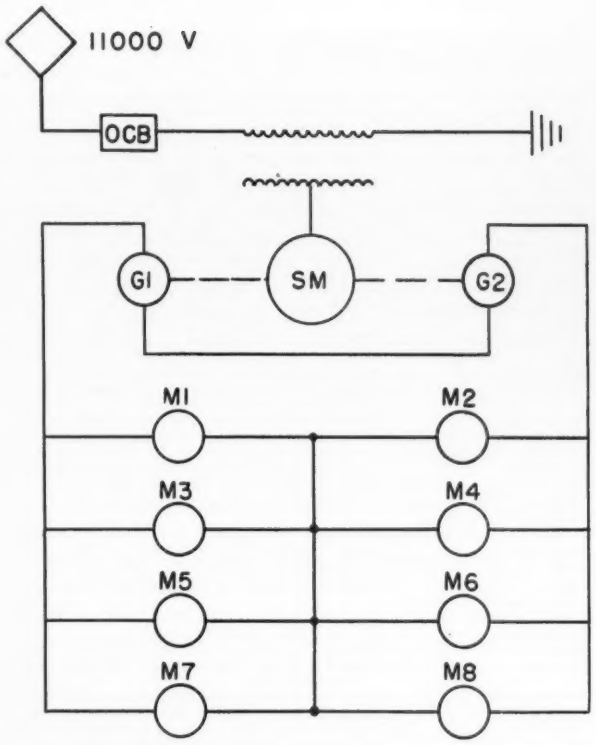
TABLE I—PRINCIPAL DIMENSIONS AND CHARACTERISTICS OF THE VIRGINIAN ELECTRIC LOCOMOTIVES

Wheel arrangement	2(B−B+B−B)
Total weight, lb.	1,000,000
Weight on drivers, lb.	1,000,000
Number of driving axles	16
Weight per driving axle, lb.	62,500
Continuous rating:	
Horsepower at rail	6,800
Tractive force, lb.	162,000
Speed, m.p.h.	15.75
Adhesion, per cent	16.2
Starting tractive force at 26 per cent adhesion, lb.	260,000
Maximum operating speed, m.p.h.	50
Length, overall, between knuckles	150 ft. 8 in.
Total wheel base	133 ft. 10 in.
Rigid wheel base	9 ft. 0 in.
Width overall	11 ft. 1 in.
Height over pantograph, locked down	16 ft. 3 in.
Driving wheel diameter	42 in.
Number of traction motors	16
Gear ratio	70/17
Contact line voltage (nominal)	11,000
Phase	single
Cycles	25
Air-brake equipment—straight and automatic	8-EL
Number of air compressors	4
Total capacity of air compressors, c.f.m.	600
Type of control—electro-pneumatic	PCL
Electric braking	Regenerativ



A. Auxiliary motor-alternator-generator set
B. Main control station
C. No. 1 control compartment
D. Equipment blowers
E. Synchronous motor
F. Traction generator
G. Traction generator
H. Regenerative exciter

General dimensions of one of the two-unit Virginian electric locomotives—The right-

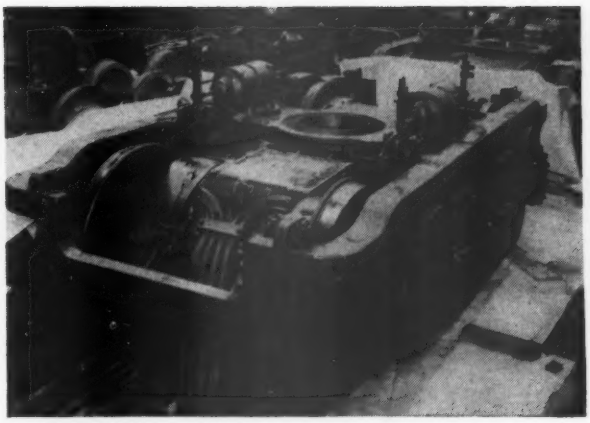


Simplified power-circuit diagram for one cab

plate while the other has a longitudinally sliding center plate.

All draft and buffing forces are transmitted through the span bolsters. Each truck center plate transmits only that part of the locomotive tractive force due to the two driving axles in that truck.

All trucks are duplicate and are interchangeable between locomotives, and also between truck positions on a given locomotive. This permits maintaining spare trucks complete with traction motors, etc., for quick replacement of any truck on any of the four locomotives. The trucks are so arranged that all



Truck assembly

connections (cables, sand pipes, air-brake hoses, etc.) between the cabs and the trucks can be disconnected and reconnected in a minimum amount of time. This permits dropping any truck on a hoist table for quick replacement.

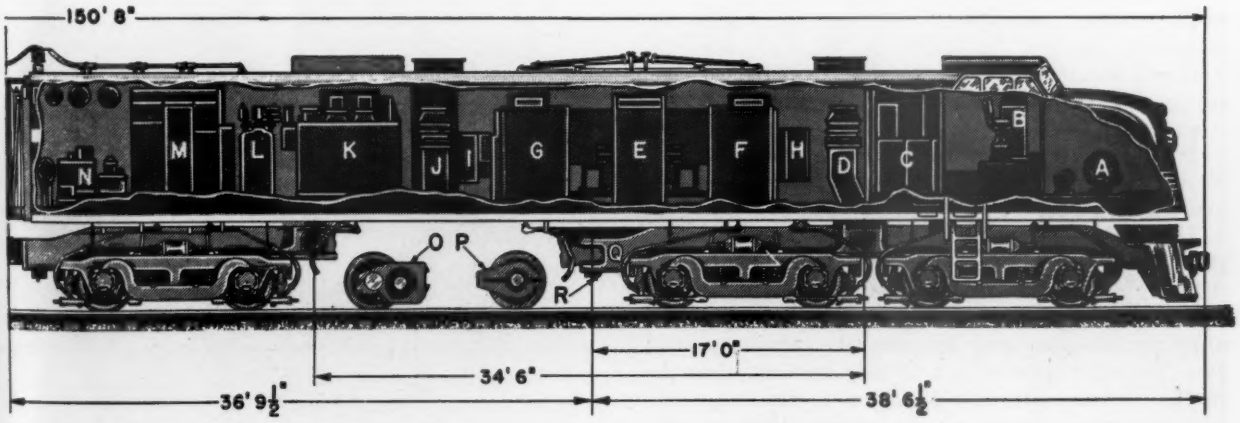
Each truck frame is a unit steel casting. The truck transom and pedestal jaws are cast integral with the frame. Twin equalizer bars of solid steel rest at each end on the tops of the journal boxes and carry the truck frame through combination coil and leaf springs. The journal boxes are equipped with roller bearings. The axle-hung traction motors have coil spring nose suspension. Wheels and gears are solid steel, and are pressed on solid forged-steel axles.

The approximate weight of principal components are as follows:

2 cabs complete	262 tons
2 outside end-span bolsters with pilots	33 tons
2 inside end-span bolsters with draw bar	29 tons
8 trucks complete with motors, etc.	176 tons
Total locomotive weight	500 tons

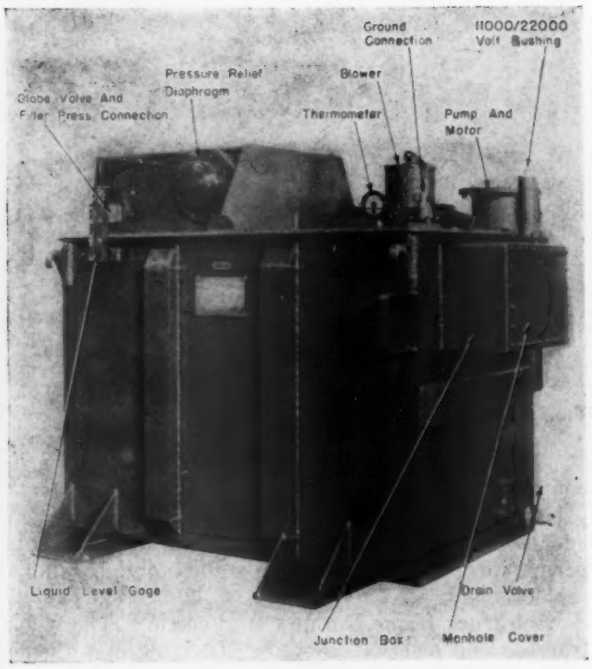
Control and Protective Devices

The control provides ultra smooth locomotive performance. There are no series-parallel transition



I. Main exciter
J. Equipment blowers
K. Transformer
L. Oil Circuit breaker
M. No. 2. control compartment
N. Air compressors
O. Traction Motor
P. Gear case
Q. Span bolster
R. Articulation pin

hand cab and part of the running gear are cut away to show the location of apparatus



Power transformer

points over the entire speed range of 0 to 50 m.p.h.

The most desirable use of the traction-motor and generator characteristics is made by selective operation of the traction motors as either self- or separately-excited machines. This permits optimum use of power for motoring or for regenerative braking at reduced traction-motor field excitations.

Driving-wheel slippage is held to a minimum by permanent parallel connection of all traction motors. Selective weight-shift compensation is provided for further protection against slippage for starting, especially with heavy trains. This weight-shift compensation is obtained by reducing the field excitation and consequently the voltage of the traction generators supplying power to the traction motors geared to the leading axles of each truck.

The master controllers, push buttons, valves, instruments, gauges, indicating lights, etc., are conveniently located in the operator's cab. Strong, rigid support is provided for all control devices, control wiring, and power cables. Special attention was given in the locomotive design to the desirability of having all devices conveniently located for ease of inspection and maintenance.

The high- and low-voltage, 25-cycle apparatus is protected by a primary protective relay. This relay detects electric grounds, overload, and short circuits. It has two trip positions. The first position opens the auxiliary circuits, and removes the auxiliary load from the main transformer. If this does not clear the fault, the relay automatically goes to full trip position and opens the oil circuit breaker, thus de-energizing the entire locomotive.

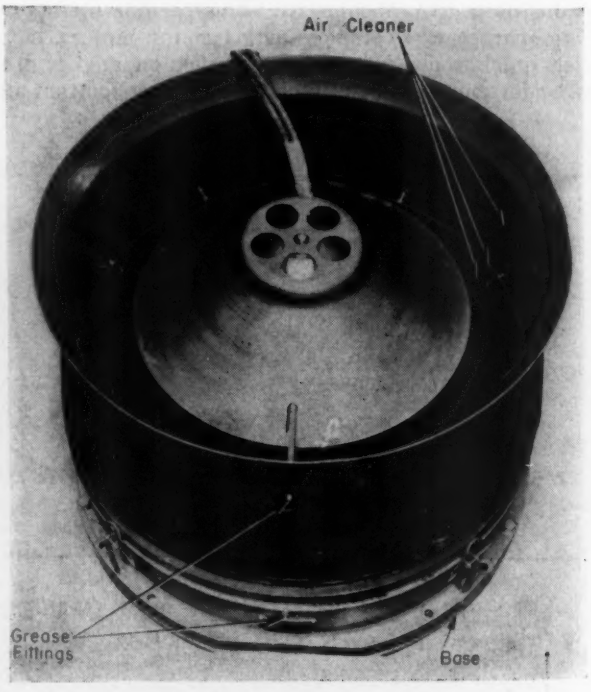
The traction motors are protected by high-speed circuit breakers and overload relays. The auxiliary apparatus is protected by the usual thermal and magnetic devices.

PARTIAL LIST OF SPECIALTIES ON THE VIRGINIAN ELECTRIC LOCOMOTIVES

Headlights	Pyle National Co., Chicago, Ill.
Windshields	Hunter Sash Co., Flushing, N. Y.
Windshield Wipers	C. A. Sprague Devices, Michigan City, Ind.
Windshield Defrosters	General Electric Co., Schenectady, N. Y.
Windshield Wings	Prime Manufacturing Co., Milwaukee, Wisc.
Sun Visors	Fulton Company, Milwaukee, Wisc.
Side Windows	O. M. Edwards Co., Syracuse, N. Y.
Seats, Cab	American Seating Co., Grand Rapids, Mich.
Horns	The Leslie Co., Lyndhurst, N. J.
Cab Heaters	General Electric Co., Schenectady, N. Y.
Door Locks	Adams & Westlake Co., Elkhart, Ind.
Inspection Card Holders	Adams & Westlake Co., Elkhart, Ind.
Storage Batteries	Electric Storage Battery Co., Philadelphia, Pa.
Fire Extinguishers	Walter Kidde & Co., Belleville, N. J.
Sanders	Morris B. Brewster Co., Chicago, Ill.
"Little Watchman"	Wright Little Watchman Co., Greensboro, N. C.
Air Brake Schedule	Westinghouse Air Brake Co., Wilmerding, Pa.
Air Compressors	General Electric Co., Schenectady, N. Y.
Foundation Brakes	American Brake Division, Westinghouse Air Brake Co., Wilmerding, Pa.
Brake Shoes	American Brake Shoe Co., New York, N. Y.
Flexible Air Ducts	Western Rubber Co., Goshen, Ind.
Vestibule Diaphragms	American Car & Foundry Co., New York, N. Y.
Bell Ringer	Transportation Devices Corp., Indianapolis, Ind.
Speedometer	General Electric Co., Schenectady, N. Y.
Train Line Receptacles	General Electric Co., Schenectady, N. Y.
Auxiliary Apparatus Circuit Breaker	Trumbull Electric Mfg. Co., Plainville, Conn.
Insulators	Locke Insulator Corp., Baltimore, Md.
Roller Journal Bearings	Timken Roller Bearing Co., Canton, Ohio
Hand Brake	National Brake Co., New York, N. Y.
Truck Frame and Span Bolster Castings	General Steel Castings Corp., Granite City, Ill.
Draft Gear	W. H. Miner, Inc., Chicago, Ill.
Draft Gear Yoke	Buckeye Steel Castings Co., Columbus, Ohio
Couplers	National Malleable and Steel Castings Co., Cleveland, Ohio
Driving Wheels	Standard Steel Works, Eddystone, Pa.
Axles	Carnegie Illinois Steel Corp., Pittsburgh, Pa.
Truck Springs	Union Spring & Mfg. Co., New Kensington, Pa.
Drawbar Iron	Ewald Iron Company, Louisville, Ky.
Radial Buffers	Franklin Railway Supply Co., New York, N. Y.
Pantographs	R. D. Nuttal Works, Pittsburgh, Pa.
Pantograph Check Valves	National Pneumatic Co., Rahway, N. J.

Transformers and Motor-Generator Sets

The main transformers have double-winding primaries, 11,000/22,000 volts. This makes them suitable for operation on the existing 11,000-volt contact system or, by reconnecting the windings, on a 22,000-



Vertical-shaft induction-motor-driven equipment blowers

volt contact system if the Virginian wishes to go to this voltage at some future time.

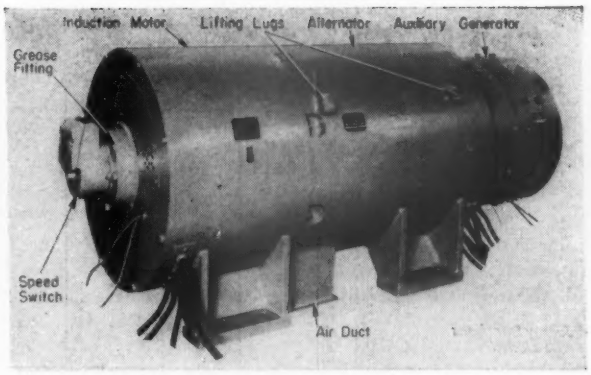
Each transformer is equipped with a motor-driven circulating pump and radiator for cooling the Pyranol.

The low-voltage windings of the transformers have taps at 557, 795, 995, and 1,550 volts for supplying auxiliary loads and for running the main motor-generator sets. The secondary of the transformer is grounded by means of an auto-transformer and protective ground relay arrangement. To drain off lightning discharges that are transmitted to the secondary, a shunting thyrite discharge resistor is connected around the auto-transformer and relay arrangement.

A roof-mounted lightning arrestor is connected to the line side of the oil circuit breaker. On the transformer side of the oil switch, and connected with as short leads as possible, a .25 m.f.d. high voltage capacitor has been installed. This capacitor will absorb transient generated by high voltage switching.

Each transformer delivers power to a five-unit, four-bearing main motor generator set at 1,550 volts, single-phase, 25-cycles. A complete motor-generator set consists of a single-phase synchronous motor, two traction generators, a main exciter, and a regenerative exciter. The synchronous-motor stator of the main motor-generator set is spring-mounted to isolate the 50-cycle vibration.

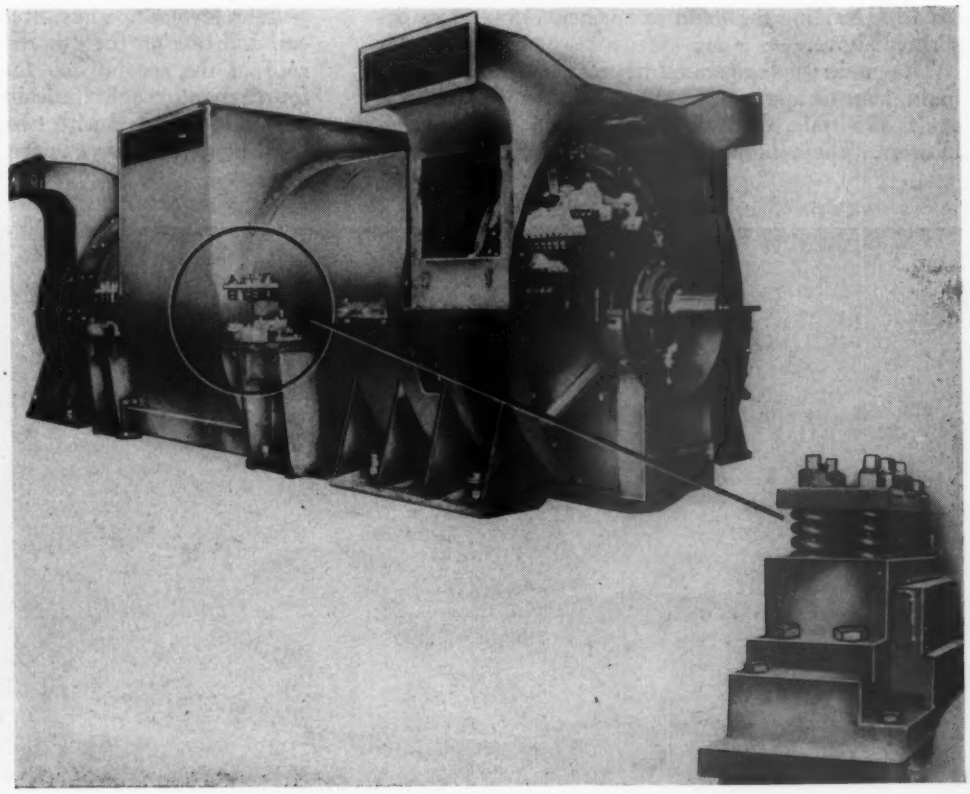
The set is started by using one of the traction generators as a starting motor. The starting power is supplied from the battery-charging generator of the auxiliary motor-alternator set located in the nose of the locomotive. The main set is thus accelerated to about 460 r.p.m. The synchronous motor is then automatically connected to the 995-volt tap of the main transformer and the set further accelerated to within a few revolutions of synchronous speed. Partial field is then applied to the motor to pull the set into synchronism and the motor connections are automatically transferred to the 1,550-volt running tap of the main transformer. The entire starting cycle takes approximately one minute.



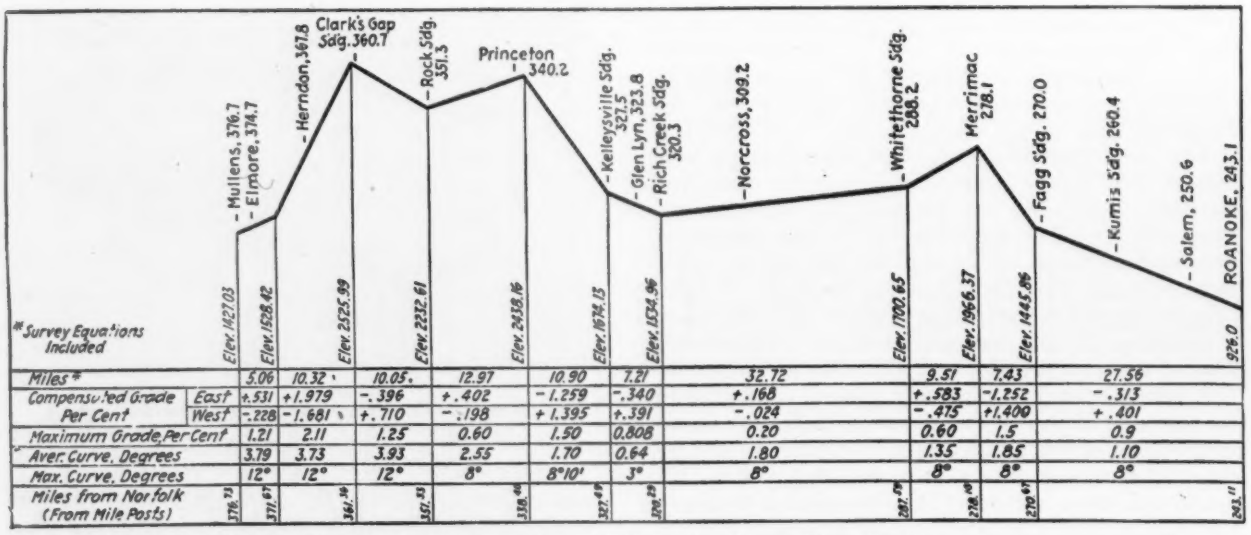
Three-unit auxiliary motor-alternator generator set

Traction Motors and Auxiliaries

Each locomotive is equipped with 16 type GE-746 d.c., series-wound traction motors. They are conventional axle-hung, box-frame motors arranged for a spring-nose suspension. Considerable advantage in operation and maintenance is anticipated in the use of these motors because, as mentioned above, they are of standard manufacture and in wide use throughout the railroad industry.



Main motor-generator set and detail of synchronous-motor spring mounting



Profile of the Electrified Division of the Virginian from Mullens, W. Va., to Roanoke, Va.

Auxiliary power for each cab is supplied by a three-unit, motor-alternator-generator located in the nose compartment. The driving motor of this auxiliary set is a 200-hp., 25-cycle, single-phase, induction motor which receives power from a low voltage (438 volts) tap of the main power transformer. The set operates at approximately 1,500 r.p.m.

The alternator of the auxiliary set is rated 157 kva. and supplies 125-cycle, three-phase, 260-volt power for the main equipment blowers and the traction-motor and transformer blowers.

The d.c. generator of the auxiliary set is rated 13.5 kw. and supplies power at 75 volts for lighting, small d.c. auxiliary power and battery charging. It is also used for starting the main motor-generator set as described above.

The main motor-generator sets, traction motors, main transformers, etc., are ventilated by vertical-shaft, 125-cycle, three-phase, induction motor-driven blowers. These blowers are special axial-flow units and have self-contained centrifugal air-cleaners incorporated where required.

Cooling air is admitted to the cab through special grill-covered roof hatches. Thence, the air enters the blowers from which it is distributed through ducts to the various apparatus units at the pressures and volumes required for proper ventilation. All apparatus, including the main motor-generator set, is ventilated by external blowing.

Each locomotive has four motor-driven air compressors, two per cab. The four compressors give a total of 600 cu. ft. per min. air capacity. They are synchronized so that an equal amount of work is done by each compressor.

Each locomotive has three pantographs, two on one cab and one on the other. Space is provided on the roof of the second cab for future installation of a fourth pantograph if desired. The locomotives are normally operated with two pantographs raised. The third pantograph is a spare for emergency use.

CONSULTING DEPARTMENT

Lighting Maintenance

Good lighting depends upon a good installation that is adequately maintained. Can you suggest some way of encouraging railroad users to keep their lighting systems in good condition?

Car Lighting Permits Little Depreciation

The proper way would be to demonstrate the benefits that follow good maintenance, and the penalties that follow neglect. This demonstration is difficult, not because benefits or penalties do not follow, but because there are no reliable data to prove the extent of the benefits or the penalties. These data must come from the railroads.

It is easy to demonstrate the benefits or penalties of good, or lax, maintenance of rolling stock, signal systems and the right of way. Lax maintenance is promptly followed by accidents involving injuries and deaths. These dramatic penalties focus public displeasure and result in quick correction. Conversely, good maintenance, with its benefit of safe operation, gives the public the feeling of security that pays off in better patronage. This benefit (safety) of good maintenance by operating crews is the principal advantage the railroads are offering to the public in competition with air transportation.

Maintenance of the interior of the cars, stations, platforms and approaches is notoriously lax, in general. Good housekeeping is the same kind of thankless job to corporations that it is to the average housewife; but she soon learns that it has to be done or she risks the health and safety of her family, her reputation among her neighbors, and in extreme cases of neglect, action by the public authorities.

The situation of the railroads is not far different, particularly as far as their reputation, which involves their good will, is concerned.

The same will that now exists to ensure safe operation of trains needs expansion to include all forms of maintenance. The railroads are trying to improve public good will and increase public patronage. Good maintenance, in the form of good housekeeping, is effective bait. It is particularly appealing to the fair sex, who influence their male partners. I know of no wife who feels easy when her husband is flying, but I know of many husbands who object to the discomfort of poor porter service for baggage, unclean stations, unclean trains, long hours of poor lighting on any except a few crack trains, ending up with inadequate or no taxi service at a dirty station at the end of the trip.

The railroads need to give good service to maintain and improve their hold on the traveling public. Good service is impossible without good maintenance.

Discussing lighting maintenance specifically, people are generally experiencing better artificial lighting conditions in their working and living environments. This is putting pressure on the railroads to improve their artificial lighting on trains and elsewhere. Owing to space, mechanical and cost limitations, lighting levels cannot go as high in trains as they are going elsewhere. It is not possible, therefore, for railroads to adopt the only safe alternative for no maintenance of their lighting systems, which is to build a depreciation factor into them large enough to compensate for dirt and depreciation. In fact, the limiting conditions are such that the railroads can build virtually no depreciation into their car lighting systems if they are to give the public anything like the lighting conditions the public wants. That means that rigid maintenance must be employed in order to keep the lighting systems operating at near the minimum level required for public satisfaction.

If such maintenance is not adopted, the railroads will only have kidded themselves into putting thousands of extra dollars into each car for the better lighting they will not be getting, and in addition to losing the money, they will lose, instead of gain, public good will. Better by far to save the money in the first place than pour it down the rat-hole of lax maintenance.

HENRY L. LOGAN
Holophane Company, Inc.

Can you answer the following question? Answers should be addressed: Electrical Editor, Railway Mechanical Engineer, 30 Church Street, New York 7.

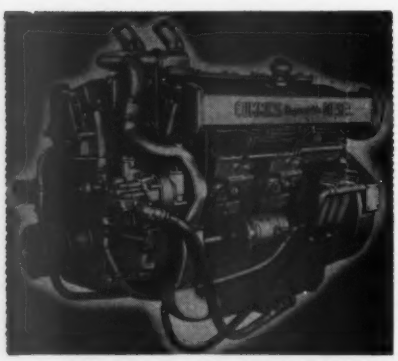
To what extent are solderless terminals and connectors suitable for railroad application?

What can seasoning do for traction motors on Diesel-electric locomotives? Should the commutators of rewound motors be seasoned? What is the recommended procedure for the process of seasoning?

NEW DEVICES

Lightweight High-Speed Diesel Engine

The latest addition to the line of Diesel engines manufactured by the Cummins Engine Company, Inc., Columbus, Ind., is the Model NVHS-1200. This engine is a four-cycle, 12-cylinder supercharged V-type with a maximum rating of 550 hp. at 2,100 r.p.m. With its naturally-aspirated companion model, the NVH-1200 which develops 400 hp. at the same speed, Cummins Diesel engines now cover the range from 58 to 550 hp. The two new engines have weights of 4,550 and 4,300 lb. respectively, for the supercharged and non-supercharged models, with corresponding weights per horsepower of 8.3 and 10.8 lb.



The cylinder block is a single casting with the twelve cylinders set at a V angle of 40 deg. This was arrived at after exhaustive study of the power impulses and harmonic forces on the crankshaft and was chosen to minimize the torsional vibration over the wide speed range. The cylinders are staggered, the right bank being slightly ahead of the left bank to allow the connecting rods to be mounted side by side on the crank pins. This design avoids forked or articulated rods and permits the use of conventional rods which are the same for both banks.

The crankshaft is the conventional six-throw type, dynamically balanced and counter-weighted to minimize the loads on the bearings. All journals and pins are induction hardened to approximately 50 Rockwell. A viscous friction damper is available to control torsional vibration and allow a wide speed range on special applications.

The pistons are of heat treated aluminum with the skirts having an interrupted surface in a diamond pattern which provides lubrication to keep wear at a minimum. Piston rings are of Keystone section better to combat the sticking tendencies of present-day fuels. The top ring, which takes most of the load, is chrome faced.

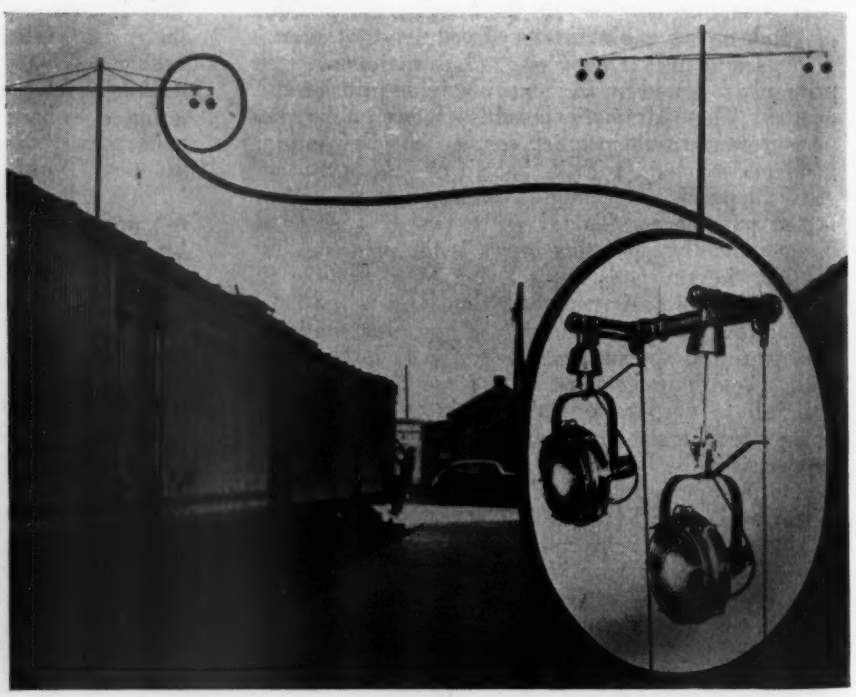
The fuel system was developed by Cummins and has two pumps, each one serving six cylinders, which are driven together but are timed to the two banks. The speed is controlled manually but is maintained at idle by a low-speed governor, and at the maximum speed range by a high-speed governor. The engine is further protected by an overspeed trip and by the built-in characteristics of the fuel pump which limits the speed in the event of a line failure. A feature of the fuel system is the low fuel line pressure, only 120 to 180 lb., between the single-plunger, distributor-type fuel pump and the injectors.

Disconnecting, Lowering Hangers

The Thompson Electric Company, 1101 Power avenue, Cleveland, Ohio, has announced the availability of its Series No. 170 and No. 180 one-piece deep-canopy disconnecting and lowering hangers which have been designed especially for outdoor lighting applications. These hangers facilitate rapid cleaning, relamping, and repairing of outdoor lighting fixtures located in plant areas, switch yards, parking zones, loading docks and shipping platforms.

A complete Thompson hanger assembly consists of two members, upper and lower. The fixed upper member contains pulley wheel for the operating chain or cable, guide tube for positive repositioning, and a pair of cup type contacts to which power feed lines are attached. The lower member supports light fixture and contains positioning stem, latching mechanism and all-face contacts which complete circuit when fixture is raised.

The deep weatherproof canopy of the No. 170 series provides for conduit connected wiring entrance integral with the sheave housing. The canopy of the No. 180 series is drilled for ¾-in. conduit entrance and is fitted with a removable two-hole threaded-porcelain bushing. Everdur or Olympia bronze sheave axle, screws, nuts, rivets and washers serve to minimize corrosion. Both heavy-duty cup type contacts and ball-face contacts are silver-plated. All load carrying parts



are of malleable iron or steel, and are cadmium-plated or galvanized to provide weather resistance.

The hangers eliminate need for ladders, scaffolds, platforms and dangerous climbing. The lighting fixture when lowered is "dead", and maintenance workers can repair, service or clean the fixture with safety from electrical hazards. They can be supplied for either manual or winch operation. They will safely support incandescent, fluorescent or mercury-vapor fixtures weighing up to 200 lb. Units are Underwriters' Laboratories rated 15 amp., 600-volt a.c., 30 amp. 250-volt a.c., and 20 amp. 250-volt d.c.

Bonnet Sealing Diaphragm Valve

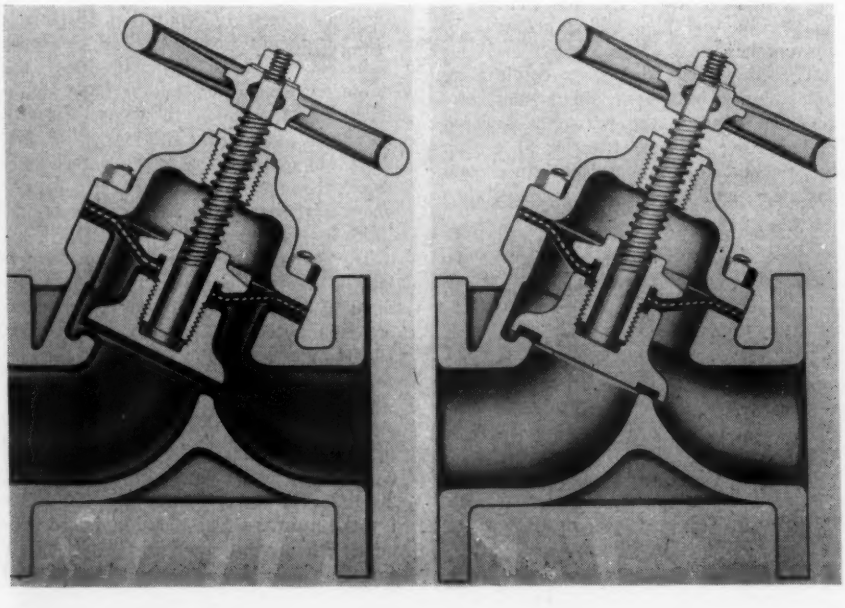
The diaphragm valve recently announced by the Crane Co., 836 S. Michigan ave., Chicago 5, is a type of "packless" valve which seals the operating parts of the valve from the line fluid, and eliminates troubles that necessitate packing maintenance. They have rising-stem construction, sizes two inches and under having the stem rising through the handwheel and the larger sizes having the handwheel rigidly attached to the stem and rising with it.

These valves are recommended for use with compressed air and liquefied gases, corrosive and noxious gases and fluids, solvents, etc. They may be used to replace any other diaphragm or conventional gate or globe valves. Where abrasive dusts are present, or where there is danger from rock slides in construction work, a cap to protect stem threads can be supplied for valves of 2-in. and smaller sizes.

A separate seating member, giving positive control of flow independently of the diaphragm, reduces the flexing to which the diaphragm is subjected and eliminates the diaphragm crushing action.

Shut-off of flow is positive at all times. Even in the event of diaphragm failure, fluid cannot pass on to the line when the valve is closed. According to the manufacturer, the valve is easier to operate than the diaphragm-closure type. Quicker closing is also a feature and the Y-pattern body design gives greater flow capacity.

Two types are available, one plain iron and the other neoprene lined and coated, both having bolted bonnets. The plain iron valves are offered in sizes ½-in. to 2-in., with screwed ends; and in sizes ½-in. to 4-in., with flanged ends. The neoprene-lined-and-coated types are made with flanged ends only, in sizes ½-in. through 4-in.



Welding Wheel Centers

The problem of rebuilding worn rims of trailer and driving wheel centers has been successfully solved by the Unionmelt welding process of the Oxweld Railroad Service Company, unit of Union Carbide and Carbon Corporation, 230 North Michigan avenue, Chicago 1.

First step in the operation is to take a very light cut on the rim. This is done to round up the wheel which has become out-of-round and to simplify the subsequent machining of the added metal. Next, a metal retaining ring is tack-welded to each side of the rim. This ring is ¼ in. by 1 in.

The wheel is positioned on a lathe underneath the welding head which is mounted on a specially fabricated column and arm. The column is held by the tool holder and the arm holding the welding head can swing in an arc so that the deposited metal can be laid down in successive parallel beads. This mounting also permits the arm to be swung to the other wheel on the axle.

The first two beads are made on each edge of the rim in the corner at the retaining ring. From 10 to 12 beads are required. To cover the 4½ in. wide rim, a second layer of deposit is made over the first layer so that the wheel diameter is increased from ¾ in. to 1 in. The welding is done at 750 to 800 amp., 30 to 35 volts using ¼-in. Oxweld No. 36 rod. Unionmelt Grade 80 composition is used and welding speed is from 20 to 24 in. per min. No preheat or postheat is employed in this process. Following the welding build-up, the pair of wheels is lifted out and placed in a lathe where the excess deposited metal is removed as the wheels are machined to size.

Paint and Varnish Remover

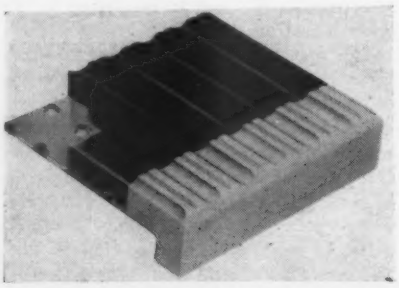
The Magnus Chemical Company, Inc., Garwood, N. J., has announced the development of Magnus Stripit, a material for removing paint and such other coatings as lacquer, primer, synthetic enamel, baked and air-dried varnish and baked automotive finish. Under normal conditions this material will remove at least three coats of paint in one application. The first coat begins to wrinkle in one to five minutes. The action of Stripit is reported to be such that a cutting stream of water directed on the surface will remove all the loosened paint in a few minutes under ordinary conditions.

Stripit is ready to use, does not require the addition of acids or thickeners, mixing, stirring or other handling. It is non-inflammable, and does not require the use of inflammable solvents. Surfaces stripped are ready for re-finishing. No neutralizing agent is required. It is safe to use on any metal or wood, and will not bleach or raise the grain of wood. Stripit is a heavy-bodied liquid which clings to vertical or inverted surfaces and is slow to evaporate.

Safety Step Edge

A highly visible white safety step edge for use on passenger car steps has been announced by Samuel Moore & Co., Mantua, Ohio. Marketed under the registered trade name of Rub-Bub White Safety Step Edge, it is made of a 5/16-in. thickness of white Rub-Bub compound containing a high percentage of live rubber. This is bonded mechanically and chemically to an integral, cupped metal backing.

The design of the surface, trade-named Dri-Foot, has wide grooves for drainage and small "squeegee" ribs that grip passenger shoe soles. This surface design, in combination with toothy texture of Rub-Bub compound, provides a non-skid surface. The manufacturer also states that the high resiliency of the



rubber compound prevents shattered shin-bone accidents.

Rub-Bub White Safety Step Edge is cut to required length and fastened in place with wood or machine screws. It can be mitered to fit curved or irregularly shaped steps.

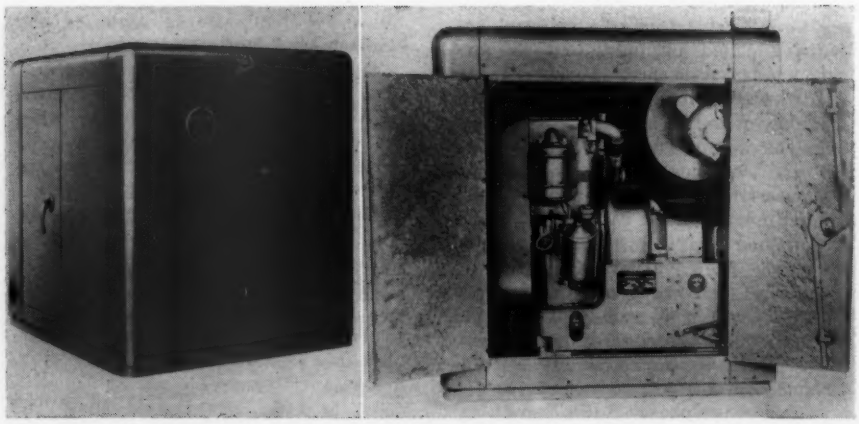
Diesel Plant For Caboose Power

A 2,500-watt packaged Diesel-electric plant, specially designed to supply power for caboose lighting and train communication is now being offered by D. W. Onan & Sons Inc., Minneapolis, Minn.

The plant is installed in a compact sheet-steel housing. The inner surfaces of the housing have 2⅜-in. layer of sound-proofing and fire-proofing material. Two hinged doors secured by locking slide bars are provided on two sides of the housing. There is a fresh air intake in the top housing panel.

The 15-gal. fuel tank is equipped with an external fuel-fill pipe. Two heavy-duty 6-volt starting batteries, with battery rack and cables, are supplied and installed. Flexible exhaust tubing is connected and run to the caboose floor outlet. A muffler is provided for exterior installation.

A thermostatically controlled, ⅓-hp. electric motor-driven blower ventilates and maintains proper operating temperature inside the housing. The complete



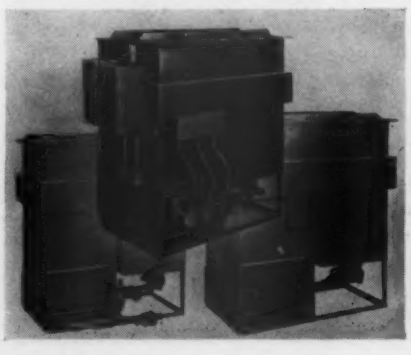
installation weighs approximately 1,000 lb.

The plant is powered by a new Onan, DSP, air-cooled, full Diesel engine. Electric cranking of the engine is made possible by an automatic compression release. The generator is inherently regulated without the use of rheostats or other external equipment. All engine and generator controls required for operation are conveniently located on the steel base. Approximately 0.136 gal. of fuel is required per kw.-hr. at full rated load.

Hand-Operated Degreaser

Announcement of the Model 625 degreaser, a two-dip hand-operated unit designed for cleaning medium-size metal parts, has been made by The Detrex Corporation, Detroit 32, Mich. The unit can be heated by steam, gas or electricity, whichever is most practical at the particular time and location. It can also be furnished for combined gas-and-steam or gas-and-electric heating. A feature of this equipment is the standardization of the main body construction so that it can be quickly converted from one type of heating to another where seasonal changes in heating method give added economy or convenience.

The Model 625 degreaser employs an immersion-solvent-vapor degreasing process. To operate, the parts are lowered into boiling solvent, transferred within the machine to a cool solvent rinse compartment, and after a few seconds, they



are removed through the solvent vapor zone. The Perm-A-Clor solvent used is non-flammable, and cannot burn or explode.

The degreaser is of all-welded construction, fabricated from 10-gauge steel plate and reinforced with structural steel. All interior surfaces are protected with a molten zinc coating which is sprayed on after fabrication. It is also available built of life-time, corrosion-resistant nickel-steel. There are no moving parts to wear or get out of adjustment.

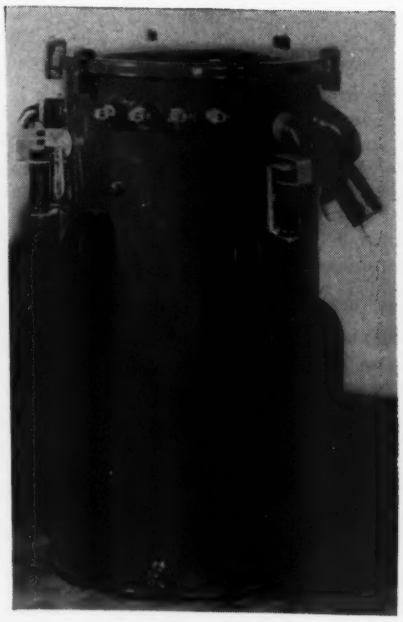
Production capacity is rated at 1,000 lb. of steel parts per hour. The unit will immersion-clean parts that will go into a space 18 in. by 21 in. by 12 in. deep; and shafts up to 4 ft. in length can be cleaned by suspending them in the vapor zone. Floor space occupied is about 10 sq. ft., and the net weight is about 500 lb.

Three-Phase Transformers

A line of CSP (Completely Self-Protected) three-phase distribution transformers for small industrial or commercial loads is announced by the Westinghouse Electric Corporation, Pittsburgh 30, Pa. Incorporating all the protective features of the CSP single-phase distribution transformers, the new units have built-in De-ion lightning arresters, three mechanically interlocked, heavy-duty circuit breakers on the secondary side as safeguards against overloads and short circuits, and primary protective links for system protection.

The three-phase line of transformers has been made possible by the development of a new type BR secondary breaker capable of successfully interrupting 10,000 amp. at the usual secondary voltages.

The new transformers are available in sizes of 9, 15, 30, 45 and 75 kva. for primary voltages of 2,400 to 14,400 inclusive and with secondary voltages of 208Y/120, 240 delta, 240 by 480 delta for the primary classification in accordance with present standards. These transformers have been designed to incor-



porate the electrical and mechanical features suggested by the EEI-NEMA fourth report on Standardization of Distribution Transformers. Transformers are equipped for pole mounting or they can be mounted on platforms or mats as required.

Lightweight Welding Helmet

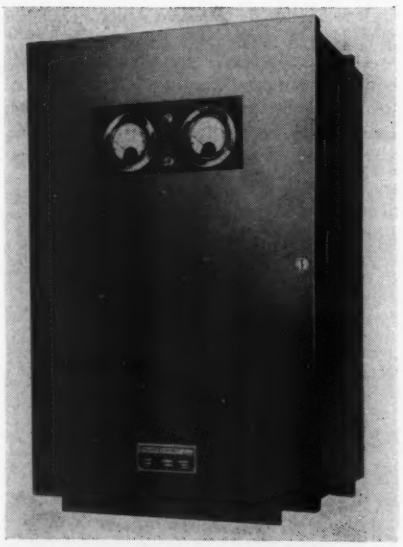
A welding helmet weighing 19 oz. and made in one piece of vulcanized fibre, riveted at the overlapping seams, has been announced by Willson Products, Inc., Reading, Pa. When in place for welding the helmet extends below and under the chin as well as over the ears for protection from flying sparks and hot metal.

The helmet is easily swung off the face for quick inspection of work. A spring action at the hinge keeps the helmet in a raised position when not in use. Comfort features include an adjustable head gear which can be readily fitted to head size by a screw clamp, and a replaceable leather sweatband for absorbing perspiration.

The new helmet contains the protective features of the Willson-Weld lens—a special-formula lens which is said to exceed the United States Federal Specifications for optical quality and protection. Willson-Weld glass is available in 12 different shades to meet the requirements of various jobs. The welding glass is protected from pitting by a clear glass cover, and both lenses can be removed.

Floating Battery Chargers

A line of electronically-controlled and regulated floating battery chargers, for power stations, communications and other applications requiring accurate control of floating voltage, has been announced by the Power Equipment Company, 55 Antoinette street, Detroit 2, Mich. Similar equipment utilizing magnetic controls has also been developed.



The new standard chargers are fully automatic in operation, have constant potential output, and are designed to maintain floating charge on the battery group to within plus or minus one per cent.

Electronic overload protection is provided which automatically limits the current to the pre-set maximum value and prevents overloading of the charger by reduction of the terminal voltage below the battery voltage. This permits the battery to carry the load until the peak requirement has passed. The battery is then automatically recharged and floated until the next power demand is received, according to the manufacturer.

Other design features incorporated in the chargers include simple compact controls having no moving parts or contacts, conservatively rated selenium rectifiers, and convection cooling. In the control circuit, standard commercial tubes are operated below manufacturers' recommended ratings, assuring extended service. There are no critical circuit requirements, according to the manufacturer, and sectionalized construction simplifies servicing and permits variations from standard to meet special needs.

Triple Valve Assembly Kit

Snap-on Tools Corporation, Kenusha, Wis., has announced the addition of a set of seven tools specially designed for general service work on AB repairs. The set is known as the AB-70 Triple Valve Assembly Kit and consists of three sizes of Bristo spline screw drivers, a special screw driver bit with a 9/16-in. by 3/32-in. blade, a 7/8-in. and 1-in. single hexagon socket, and a 9/16-in. single hexagon tapered socket. As the set comes in a cardboard box, it makes a complete yet compact unit for storekeepers to stock. All units have a gun-metal finish and are broached to receive 1/2-in. square drive handles.

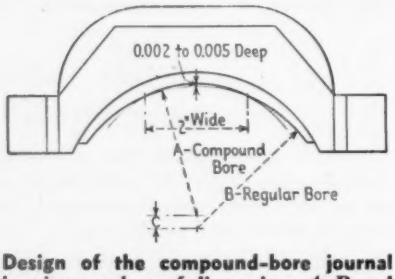
Carbon Steel Adjustable Wrenches

J. H. Williams & Co., Buffalo, N. Y., announces the addition of a new line of carbon steel adjustable wrenches which are thinner and lighter than conventional carbon steel adjustable wrenches of similar capacity. They have thin, tapered jaws and possess unusual strength and toughness due to an exclusive improvement in design and materials. Made in 4-, 6-, 8-, 10-, 12-, 15- and 18-in. sizes with maximum capacities from 1/2 in. to 2 1/16 in., they are drop-forged from specially selected steel and heat-treated for uniform strength.

These new wrenches have the Williams patented sliding jaw feature. The design of the square shoulders on the shank portion of the sliding jaw provide maximum and positive bearing against working stress eliminating the wedging and spreading action.

Compound-Bore Journal Bearing

A compound-bore journal bearing for both freight and passenger car service has been announced by the National Bearing Division of the American Brake Shoe



Design of the compound-bore journal bearing—values of dimensions *A*, *B* and *C* for different-size journals are listed in the accompanying table.

SIZE	A—DIA.	B—DIA.	C
5 x 9	5.004	5 1/16	1/32
5½ x 10	5.504	5 9/16	1/32
6 x 11	6.004	6 1/16	1/32
6½ x 12	6.504	6 9/16	1/32

Company, 4930 Manchester avenue, St. Louis 10, Mo.

A secondary bore has been precision machined in the bore of the standard journal bearing for wider initial contact area with the journal to aid the formation of the fluid lubricating film and to minimize the film pressures. This is said to result in a lower temperature run-in and to contribute to the reduction of hot boxes during the breaking-in period. The compound bore provides a better fit on undersized axles, too, minimizing the necessary conformation of the bearing to the smaller axle sizes.

Rod Clamp for Gravity Drop Hammer

This clamp, a prime feature of a new gravity drop hammer, made by the Chambersburg Engineering Company, Chambersburg, Pa., is the device used for holding the ram at the top of the hammer's stroke. It comprises two steel blocks supported in a suitable frame and is held in a horizontal position by an air valve when the rod is moving up or down.

The rod moves freely between the surfaces of the clamping blocks. When it is desired to hold the ram at the top of the stroke, (or at any point on the down stroke), the clamp drops and the clamping blocks grip the rod instantly, halting all movement. The rod may be released by lifting the clamp to the horizontal position.

Replaceable shoes form the wearing surface between clamping blocks and rod; and an eccentric pivot action is provided to take up the normal wear.

Truck-Battery Charging Rectifiers

Fansteel Metallurgical Corporation, North Chicago, Ill., has designed a series of selenium rectifiers for charging 15, 16 or 18 cells of lead battery, or 20 to 24 cells of Edison battery, of the type commonly used in electric trucks.

The selenium rectifier stacks and other component parts are built to withstand heavy duty service. All controls which the operator needs to use are on the out-

side panels. Other parts are securely housed in a ventilated cabinet.

Operation is automatic in that the operator merely connects the battery to the charger and sets the electric time switch. At the conclusion of this charging cycle, the battery is disconnected from the rectifier and the a.c. supply line is disconnected automatically. Should there be a power failure, the battery is disconnected from the rectifier and when power is restored, circuits are automatically re-closed, and the charging of the battery resumes at whatever point in the cycle the charger was interrupted.

In charging lead batteries, the two-rate method is used. This is the "modified constant potential" system which is the accepted standard for rectifiers for charging electric truck batteries. Charging begins at a high rate, and when the finish charge should begin, an Exide "TVR" relay operates, inserting resistance into the d.c. charging circuit. The duration of the finish charge is determined by the electric time switch. At the end of the finish cycle rate, the time switch opens, disconnecting the battery from the rectifier and disconnecting the a.c. supply line.

Unlike lead batteries, Edison batteries should be charged at an almost constant rate for entire period. For this purpose, the operator sets the time switch for the desired length of time (usually 1 to 12 hours). With both lamps indicating that the rectifier is in operation, the battery charges at the high rate for the entire period. At the end of the period, the electric switch disconnects both the battery from the rectifier and the a.c. supply line.

In addition to the indicator lamps, an ammeter and a voltmeter give visual indication of charging rate. The chargers are manufactured in four standard models.

Vertical Sander

A vertical sander, weighing 8 lb. 7 oz., and having an overall height of 7 in. has been announced by Buckeye Tools Corporation, Dayton, Ohio. The latest addition to the Buckeye line of air and electric powered portable tools is a medium-duty model.

The tool is also designed for use as a grinder with cup-type counter-bored center wheels and cup wire brushes. It is available in free speeds of 4,500, 5,500, 6,000, 7,200 and 8,500 r.p.m., and is equipped with a "stream-power" governor to give constant speed under load.

NEWS

Railroad Diesel Locomotive Inventory on December 31

According to statistics compiled by the Railway Age, 9,035 Diesel locomotive units were in service on domestic railroads on December 31, 1948, of which 8-218 were owned by Class I railroads, excluding switching and terminal companies, and 817 by terminal and switching companies and Class II and III railroads.

Diesel road locomotive units in service totaled 4,580, aggregating 7,156,240 hp.—nearly 70 per cent of the total horsepower of all classes of Diesel locomotives in service on Class I railroads.

The Diesel locomotive inventory of Class I railroads was increased during 1948 by nearly 39 per cent—from 5,919 units on December 31, 1947, to 8,218 units on the last day of 1948. This increase included 9 units of 3000 hp.; 260 units of 2000 hp.; 1,323 units of 1500 hp. The distribution of the horsepower of Diesel locomotive units on Class I railroads, switching and terminal companies not included, as of December 31, 1948, is presented in the accompanying table.

DIESEL UNITS IN SERVICE—CLASS I RAILROADS

	Freight locomotive units		Pass. and comb. pass. and freight locomotive units		Total	
Horsepower	No.	Total hp.	No.	Total hp.	No. units	Hp.
3,000	13	39,000	22	66,000	35	105,000
2,000	102	204,000	857	1,714,000	959	1,918,000
1,800	....	.....	36	64,800	36	64,800
1,350 or 1,500	2,955	4,264,050	450	665,550	3,405	4,929,600
1,200	....	.....	13	15,600	13	15,600
1,000	80	80,000	28	28,000	108	108,000
Less than 1,000	18	11,460	6	3,780	24	15,240
Total road locomotive units	3,168	4,598,510	1,412	2,557,730	4,580	7,156,240
Switching locomotive units (Averaging approx. 857-hp. per unit)					3,638	3,119,050
Total road and switching units					8,218	10,275,290

Note:—817 Diesel locomotive units of 653,400 hp. are estimated to be in service by switching and terminal companies and on Class II and III railroads.

1948 Equipment Installations

CLASS I railroads and railroad-owned and controlled refrigerator-car companies placed 102,737 new freight cars in service in 1948, the largest number since 1925, when approximately 105,000 were put in service, according to the Association of American Railroads. New car installations in 1947 totaled only 63,312. Locomotives installed last year totaled 1,487 as compared with 843 in 1947.

The Class I roads and their affiliated refrigerator-car lines had 89,437 cars on order January 1 as compared with January 1, 1948, orders for 105,112. The former figure included 36,069 cars to be built in railroad shops and 53,368 on order from contract builders. By types of cars it included 16,522 box, of which 16,422 will be plain and 150 automobile; 41,419 hoppers, of which 4,260 will be covered hoppers; 19,623 gondolas; 4,016 flat; 5,776 refrigerator; 755 stock, and 1,276 miscellaneous. Locomotives on order January 1 totaled 1,633, including 1,561 Diesel-electrics and 72 steam.

The 102,737 freight cars installed last year included 40,490 box, of which 39,226 were plain and ventilated and 1,264 were automobile; 41,234 hoppers, of which 1,885 were covered hoppers; 13,108 gondolas; 6,534 refrigerator; 592 flat; 350 stock; and 429 miscellaneous. The 1,487 locomotives installed last year included 1,397 Diesel-electrics, 86 steam, and 4 electrics.

Freight cars retired last year by the Class I roads and their affiliated refrigerator car companies totaled 81,659, of which 9,125 were retired in December. Retirements in 1947 totaled 71,331 cars.

Orders and Inquiries for New Equipment Placed Since the Close of the April Issue

LOCOMOTIVE ORDERS

Road	No. of locos.	Type of loco.	Builder
Chicago, St. Paul, Minneapolis & St. Paul	6[1]	1,500-hp. Diesel-elec. frt.	Electro-Motive
Pennsylvania	2[2]	5,626-hp. elec. frt.	Westinghouse Elec. Corp.
	2[2]	5,000-hp. elec. frt.	General Elec. Co.

[1] Estimated cost $1,102,600.

[2] Each of the two units of one Westinghouse locomotive will have three four-wheel trucks and each of the two units of the other Westinghouse locomotive will have two six-wheel trucks. Each unit of the two-unit General Electric locomotives will have two four-wheel trucks. The locomotives are all experimental.

NOTES:

Chesapeake & Ohio.—The C. & O. has cancelled orders for 500 70-ton coal cars and 15 2-6-6-2 steam freight locomotives. The coal cars are a portion of orders placed last year with the American Car & Foundry Co. and the locomotives were part of an order for 25 from the Baldwin Locomotive Works.

New York Central.—The New York Central has completed plans to Dieselize all freight service between the Ohio river and Lake Erie on its Ohio Central division, according to C. F. Wiegele, general manager of the Central's Lines West. By next fall, Mr. Wiegele has said, all road freight power between Hobson and Toledo on the Ohio Central is expected to be Dieselized, and by a year or two later Diesel-electric locomotives are expected to take over yard operations.

New York, New Haven & Hartford.—The Hartford division of the New Haven will be completely Dieselized this year, according to the road's recently released annual report for 1948. The report reveals that 95 per cent of the road's freight service, 92 per cent of its passenger service and 84 per cent of its yard-switching mileage is now handled by Diesel-electric and electric locomotives.

St. Louis-San Francisco.—The directors of the St. L.-S. F. have authorized the purchase of 20 1,500-hp all-purpose road switchers to permit "complete Dieselization" of certain lines.

Miscellaneous Publications

STANDARD METAL DIRECTORY. Published by the Atlas Publishing Company, 425 West Twenty-Fifth street, New York 1. 999 pages, 6 in. by 9¼ in.; cloth bound. Price, $15. This eleventh edition embraces, in five sections, iron and steel plants; ferrous and non-ferrous metal foundries; metal rolling mills; smelters and refiners of non-ferrous metals, and a new section, "Metal Products Index," which lists geographically distributors of steel and metal products arranged according to commodities. Contains over 10,000 reports on steel mills, foundries, smelters, rolling mills and non-ferrous metal plants located in the United States and Canada—their capitalization, location, officers, purchasing agent, sales manager, products manufactured, etc. Railroad purchasing agents also listed.

SUPPLY TRADE NOTES

LYON-RAYMOND CORPORATION. *George G. Raymond, Jr.*, sales manager of the Lyon-Raymond Corporation, Greene, N. Y., has been elected also a vice-president of the firm.

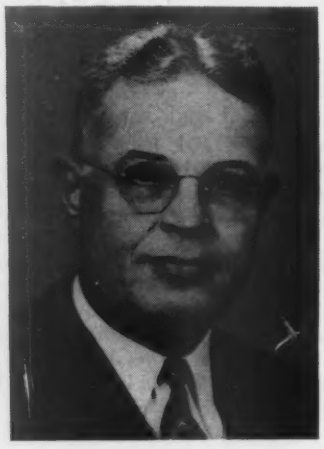
◆

STANDARD STOKER COMPANY. — The Standard Stoker Company has acquired exclusive manufacturing and sales right to the Chicago Automatic Spreader Stoker for use in stationary boiler plants. The Chicago stoker will be manufactured at Standard's Erie, Pa., division plant.

◆

GISHOLT MACHINE COMPANY. *Clifford J. Baxter* has been appointed general sales manager of the Gisholt Machine Company, Madison, Wis. *Howard V. Myers*, who has been with the Chicago office for nearly 15 years, will succeed Mr. Baxter as district manager. Mr. Myers will be assisted by *Erv A. Huza*, formerly with the Philadelphia and Kansas City offices.

Mr. Baxter has been with the company for 25 years, having started his



C. J. Baxter

career in the shop. His next move was to the Service Department. For the past 20 years he has been district manager of the Chicago office.

◆

AMERICAN LOCOMOTIVE COMPANY; LIMA-HAMILTON CORPORATION. — Repair parts for steam locomotives which were manufactured by the American Locomotive Company, are now available from the Lima-Hamilton Corporation. This, however, does not alter the activities of the Railway Steel Spring Division of the American Locomotive Company, which will continue to manufacture locomotive tires, springs, box lids, pedestal liners and wear plates at its plants at Latrobe, Pa., and Chicago Heights, Ill., or of the American Locomotive plant at Richmond, Va., which manufactures specialties including staybolts and reverse gears. Lima-Hamilton has procured from the American Locomotive Company the patterns, boiler formers and special fixtures and gauges which were used by the American Locomotive Company in the manufacture of steam locomotive parts, and also certain special machinery. Inquiries for repair parts, for steam locomotives built by American Locomotive should be sent directly to the Lima-Hamilton Corporation at Lima, Ohio.

◆

DUFF-NORTON MANUFACTURING COMPANY. — *James F. McCartney* has been appointed eastern district sales manager of the Duff-Norton Manufacturing Company, with headquarters at New York, to succeed *G. L. Mayer*, who has retired but will continue with the company in an

J. F. McCartney

advisory capacity. Mr. McCartney was formerly associated with the Pressed Steel Car Company and, for the past seven years, was eastern representative with offices in New York.

◆

BINKS MANUFACTURING COMPANY. The following appointments have been made in the sales organization of the Binks Manufacturing Company, Chicago: *H. J. Fink*, to direct sales and service in Colorado, Kansas, Nebraska, Wyoming, Montana and New Mexico, from headquarters at 346 Grant street, Longmont, Colo.; *C. J. Rood*, appointed manager of the branch office at 117 E. Michigan avenue, Indianapolis, Ind., to direct sales and service in Indiana; *M. B. Scully*, to handle sales and service in northern Illinois and Iowa, with headquarters at 1028 E. Euclid avenue, Princeton, Ill.; *E. J. Cremer*, to handle sales and service in southern Illinois and Missouri, with headquarters at 705 Olive street, St. Louis; *B. R. Fulton*, to be in charge of the new and enlarged direct factory sales and service branch at 1231 W. Ninth street, Cleveland, Ohio, handling sales and service for the Ohio territory, and *Harvey J. Dueno*, appointed manager of the direct factory sales and service branch in Milwaukee, Wis., to be responsible for sales and service throughout Wisconsin, peninsular Michigan, Minnesota, North Dakota and South Dakota. The Milwaukee office was recently moved into larger quarters at 1123 North Jackson street.

◆

CARNEGIE-ILLINOIS STEEL CORPORATION. —*James M. Darbaker*, manager of operations for the Chicago district of the Carnegie-Illinois Steel Corporation (subsidiary of the United States Steel Corporation), has been appointed general manager of sales, and has been succeeded by *Stephen M. Jenks*, general superintendent of the Gary (Ind.) works. *John H. Vohr*, assistant general superintendent of the South Chicago plant, replaces Mr. Jenks. *Edwin H. Gott*, assistant general superintendent of the Gary plant, succeeds Mr. Vohr.

Mr. Darbaker, a graduate of the University of Michigan, began his career at the Vandergrift (Pa.) plant of Carnegie-Illinois, where he worked during summer

James M. Darbaker

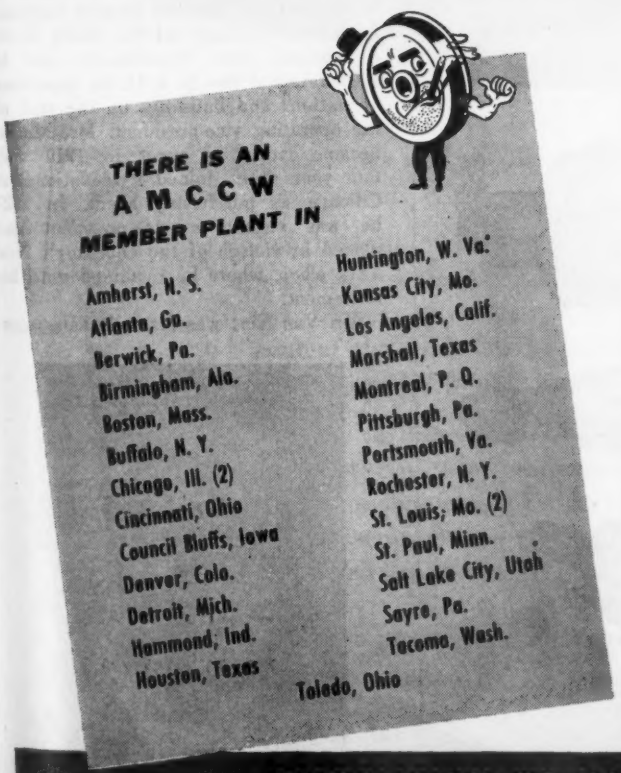
vacations while attending high school. After serving for 12 years at Vandergrift, Wellsville, Ohio, and New Castle, Pa., he became master mechanic of the Gary sheet mill in 1932. In 1933 he was appointed assistant to plant manager; in 1934, manager of the combined sheet and tin mill; in 1943, assistant manager of operations for the Chicago district, and in 1947, district manager of operations.

◆

PYLE-NATIONAL COMPANY. *A. N. Martin*, vice-president of the Pyle-National company, with headquarters at New York, retired on April 1, following

Chilled Car Wheels REDUCE

COSTS BECAUSE....

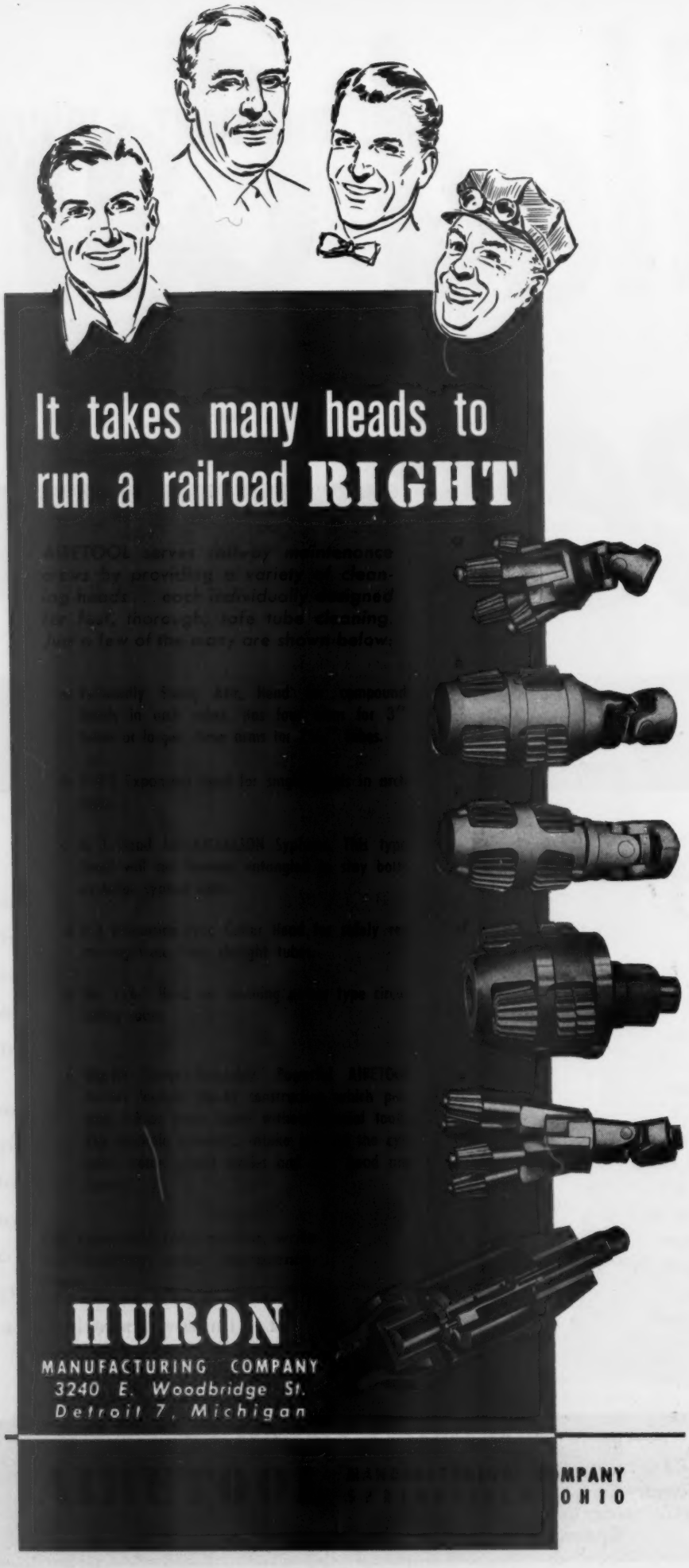


• • • the 29 AMCCW foundries where they are made are so widely spread from coast to coast that wheels are delivered to many users over shorter distances. In fact, most American railroads have one or more of these plants either on their line or very close to it.

Whether it is Montreal or Houston, Boston or Tacoma, at each point in the list of foundry locations, you will find (1) a reliable source of chilled car wheels and (2) a dependable outlet for wheel scrap. Furthermore, AMCCW Membership is the mark of a company well in the forefront of every sound new development in improved wheel service.

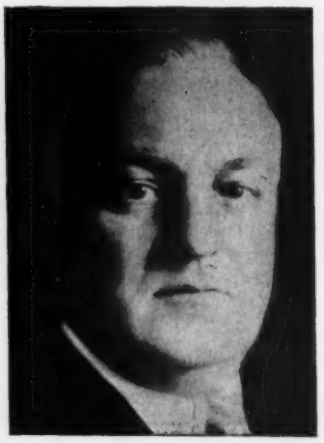
ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

AMCCW



31 years of service with the company. *John F. Van Nort* has been appointed manager of Pyle-National's western division, with headquarters at 25 Beale street, San Francisco, Calif. *T. W. Milligan* has been appointed manager of the central sales division, with headquarters at Chicago, and *James V. Baker* has been appointed assistant manager of the division, with headquarters at Cleveland, Ohio.

Mr. Martin was born on November 9, 1879, at Covington, Ky. He entered railroad service with the Cleveland, Cincinnati, Chicago & St. Louis (now part of the New York Central System) in 1895 as a clerk at Cincinnati, and two



A. N. Martin

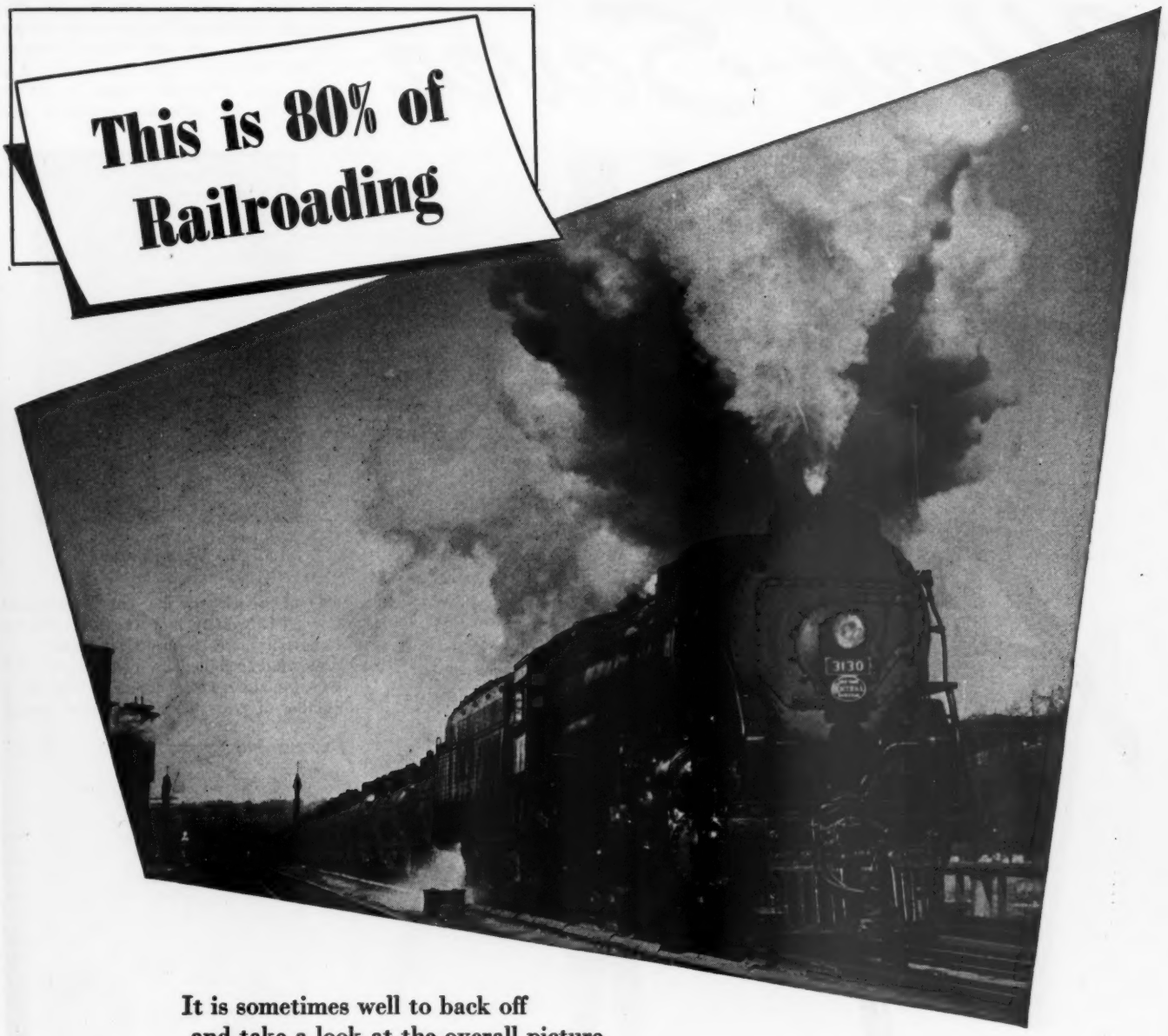
years later, joined the Baltimore & Ohio as a clerk in the traffic department at Baltimore, Md. He next became assistant to general manager of the Holly River & Addison (now abandoned), and in 1904 rejoined the B. & O. as supervisor of stations and buildings on the staff of the operating vice-president. Mr. Martin became industrial agent in 1914 and, four years later, joined Pyle-National at Chicago as purchasing agent. In 1927 he was elected a vice-president and placed in charge of the company's New York office, where he remained until his retirement.

Mr. Van Nort was formerly sales man-

John F. Van Nort

ager of the Duff-Norton Manufacturing Company, Pittsburgh, Pa., and was

This is 80% of Railroading



It is sometimes well to back off
and take a look at the overall picture.

We're thinking of the steam locomotive. These locomotives are producing three *billion* ton-miles—and will do it again tomorrow and the next day. They—these steam locomotives—are doing 80 per cent of the work on the railroads—more work than they ever did in any year before 1941.

Many of these locomotives are old, too old, and have distorted the statistics on performance. Many, however, are modern. And on modern steam power—locomotives that pack 5000 to 9000 horsepower and can stay on the road for 16 and 18 hours, and then turn around in an hour or two—the statistics look pretty good.

We build such modern power—and are convinced that it has its place.

LIMA HAMILTON CORPORATION

DIVISIONS: *Lima, Ohio* — Lima Locomotive Works Division; Lima Shovel and Crane Division. *Hamilton, Ohio* — Hooven, Owens, Rentschler Co.; Niles Tool Works Co. *Middletown, Ohio* — The United Welding Co.

PRINCIPAL PRODUCTS: Locomotives; Cranes and shovels; Niles heavy machine tools; Hamilton diesel and steam engines; Hamilton heavy metal stamping presses; Hamilton-Kruse automatic can-making machinery; Special heavy machinery; Heavy iron castings; Weldments.

Work-Saver POWER FOR HAND PIPE TOOLS

One man carries it!

RIDGID Model "400"—lightest power unit made—practically no upkeep

● You *can* take it with you, for the job-tested Model "400" power drive weighs just a little over 100 pounds. Modern lightweight alloy case can't be topped for strength and durability. Universal motor—forward, reverse; light socket power, turns pipe for your hand threaders, cutters, reamers —saves time, effort. RIDGID lathe-type 3-jaw chuck in front with chuck wrench ejector; self-centering workholder in rear turns with pipe. Sealed-in lubrication . . . no oil to spill. See the RIDGID "400" at your Supply House.

RIDGID

WORK-SAVER PIPE TOOLS

THE RIDGE TOOL CO. • ELYRIA, OHIO

previously associated with the Oil Well Supply Company. For two years he also operated his own coal mining business.

Mr. Milligan joined Pyle-National in 1945, and, after two years in the St. Paul (Minn.) office, was appointed man-

T. W. Milligan

ager of the western division. He attended Cornell University, and was in the Marine Corps air forces from 1941 to 1945.

Mr. Baker joined the company in 1919 as sales and service engineer, and for a number of years, handled general special

James V. Baker

assignments throughout the country. For the last six months he has been assisting in the organization of the central sales division.

◆

MONROE AUTO EQUIPMENT COMPANY. *C. S. McIntyre, III*, has been appointed service manager of the Monroe Auto Equipment Company, Monroe, Mich. Mr. McIntyre was formerly sales manager for the Newgren Company, in the Michigan, Indiana, and Kentucky area.

◆

DEARBORN CHEMICAL COMPANY. *H. Neville Potter* has been elected executive vice-president and general manager of the Dearborn Chemical Company, Toronto, Ont. Mr. Potter was appointed technical director in 1945.

◆

AVILDSEN TOOLS & MACHINES, INC.—The *Clark Equipment Company* has transferred substantially all the assets of its Celfor tool division, at Buchanan,

"They just washed Casey's engine with Wyandotte Rillor"

Casey is visibly impressed with the cleanliness of his locomotive. But he'd be even more impressed if he saw how quickly and economically engines, tenders and passenger coaches are washed with *Wyandotte Rillor*.

Rillor is a mildly alkaline cleaner with unusual wetting and soil-suspending power. In solution, it *clings as it cleans*, remaining on vertical surfaces long enough to penetrate and loosen dirt, oils and traffic soil. Finally, it rinses freely — even after drying on — and leaves a bright, attractive surface with a glossy sheen.

Rillor is completely safe to use on paint and lacquer finishes.

We will be glad to demonstrate the advantages of Wyandotte Rillor, at your convenience and without obligation. May we send you detailed information?

WYANDOTTE CHEMICALS CORPORATION

Wyandotte, Michigan • Service Representatives in 88 Cities

Wyandotte

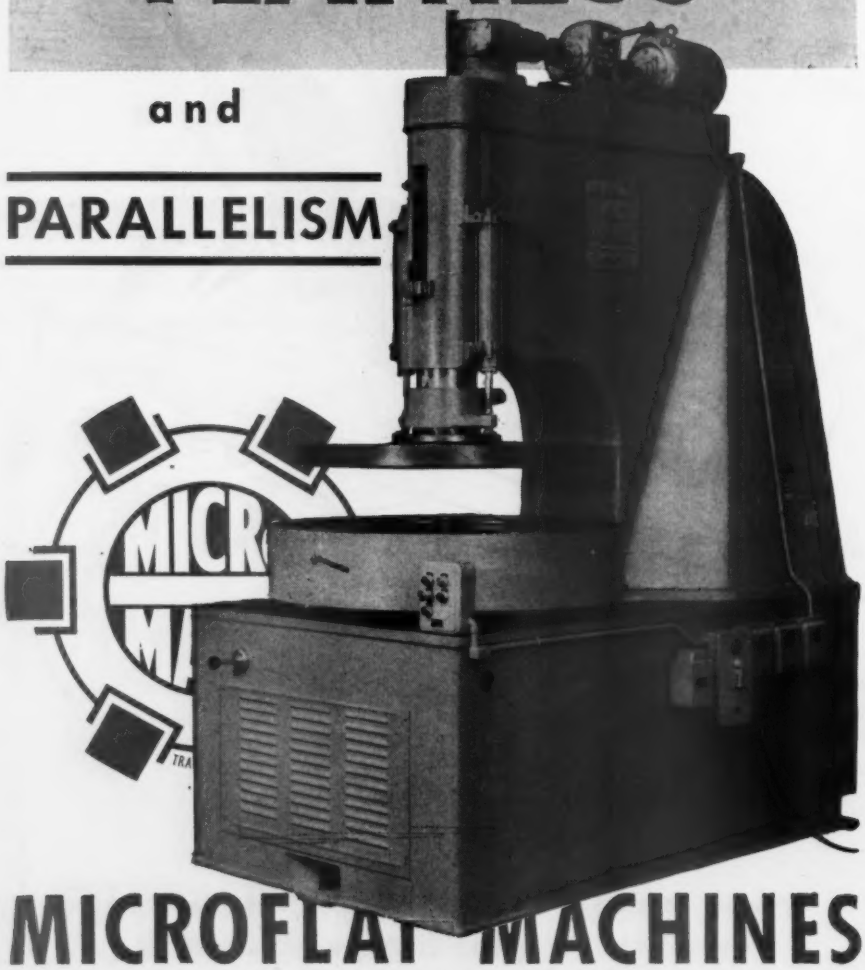
REG. U. S. PAT. OFF.

Productively Generate

SURFACE FLATNESS

and

PARALLELISM



MICROFLAT MACHINES

24 sets—48 parts—of these hardened Gerotor pump gears are finished simultaneously on a Model 844-2 MICROFLAT machine. The surface is optically flat and parallel within 0.0001 inches. Production is approximately 1200 parts per hour.

Double Surface MICROFLAT machines provide a high production method of generating parallelism between two opposite faces of a part, in one operation. This is accomplished by mounting a number of parts in fixtures which rotate about their own centers while turning around a pivot gear. Lapping plates, above and below the fixtures, revolve in opposite directions about the common center. This assures that every point on each surface will be abraded by the full area of the plate. Loose abrasive is automatically applied to the plates. The operation of these machines is simple and the results are consistently accurate.

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE, DETROIT 4, MICHIGAN

DISTRICT FIELD OFFICES:

1323 S. Santa Fe, Los Angeles 21, California
616 Empire Bldg., 206 S. Main St., Rockford, Ill.
55 George St., Brantford, Ont., Canada
Micromold Manufacturing Div., Boston Post Road, Guilford, Conn.

Mich., to Avildsen Tools & Machines, Inc., of Chicago and New York. Certain of the key personnel of the Celfor division are to join Avildsen. As a user of Celfor tools, Clark Equipment will have a continuing interest in their production by Avildsen. The new Celfor division of Avildsen will maintain adequate service to users and distributors of Celfor tools.

◆

COOPER-BESSEMER CORPORATION.—The Cooper-Bessemer Corporation has been licensed by the *International Nickel Company* to produce magnesium-treated cast iron. Initial research and development work relative to the use of this iron in engine construction is being conducted at the Grove City, Pa., plant of Cooper-Bessemer. The company's foundries at Mount Vernon, Ohio, will eventually produce the new iron.

◆

STANDARD RAILWAY EQUIPMENT MANUFACTURING CO.—*H. L. Kent* has been appointed assistant to the president of the Standard Railway Equipment Manufacturing Company at New York.

Mr. Kent was born in Scranton, Pa., on March 20, 1903. He attended the public schools there and Lafayette College, Easton, Pa. He joined the Ingersoll-Rand Company on February 1, 1925, as service engineer in the Scranton branch office, and later handled the company's industrial sales in the St. Louis, Mo., and Philadelphia, Pa., territories, successively. He was appointed central manager of the railroad department, at

H. L. Kent

Cleveland, Ohio, on May 1, 1940, and manager of the railroad department, with headquarters at New York, in January, 1942. Mr. Kent resigned from the latter position to become associated with the Standard Railway Equipment Manufacturing Company on April 1.

◆

SCHAIBLE COMPANY. The Schaible Company, Cincinnati, Ohio, has announced the acquisition of the *D. T. Williams Valve Company*, also of Cincinnati. Plans have been made to expand the Williams operations both in production and marketing, particularly in industrial fields covering general industry, oil and gas, public works and marine and railroad transportation. *Cara L. Lane*, works manager of Schaible's

The *Forced* Re-circulation Principle
in a steam generator insures
MAXIMUM STEAM CAPACITY
AT *All* TIMES
Specify the *Elesco Forced*
Re-circulation Steam Generator for
your diesel-electric or electric loco-
motives . . . it has this important
feature.
THE
SUPERHEATER
COMPANY, INC.
Division of COMBUSTION ENGINEERING - SUPERHEATER, INC.
Representative of AMERICAN THROTTLE COMPANY, INC.
60 East 42nd Street, NEW YORK
122 S. Michigan Ave., CHICAGO
ELESCO
Montreal, Canada, THE SUPERHEATER COMPANY, Ltd.

Superheaters • Superheater Pyrometers • Exhaust Steam Injectors • Steam Dryers • Feedwater Heaters • Steam Generators • Oil Separators • American Throttles

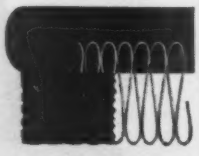
Alaskan R. R. Refrigerator Car Doors are Weatherstripped with

BRIDGEPORT INNER-SEAL

Uniquely designed and ruggedly constructed*, Inner-seal Weatherstrip was chosen recently for main door gaskets on 125 Jumbo Refrigerator Cars to be used by the Alaska Railroad. The cars, remodeled from wartime troop sleepers by the Chicago Freight Car and Parts Co., will be subjected to most extreme operating conditions. Winter temperatures often drop to −67° while midsummer heat hits 95°, yet car interiors must be held between 35° and 40° to protect highly perishable foodstuffs being shipped from Canada and the U. S.

That Inner-seal will meet this test has been proved through experience. On special refrigerator cars subject to temperatures of −110°F where evaporation losses had been 30% and higher, Inner-seal gaskets sealed so perfectly that losses dropped to less than 3%.

Write today for data sheet giving complete details on sizes, shapes and materials.



***A live sponge rubber bead molded for life onto a flange woven of rust-resistant, tough spring wire and strong cotton thread. Bead and flange are neoprene-coated to resist the ravages of sunlight, oils and abrasives.**

Bridgeport
FABRICS, INC.
BRIDGEPORT 1, CONN.
Est. 1837

Represented in Canada by
THE HOLDEN CO., LTD., Montreal, Toronto, Winnipeg and Vancouver, B. C.

parent plant, also will direct operations of the Williams plant. *Clifford B. Mueller*, general sales manager of Schaible, also will direct sales of the Williams division.

◆

ELECTRO-MOTIVE DIVISION, GENERAL MOTORS CORPORATION.—The Electro-Motive Division of General Motors has announced a price reduction of approximately 5 per cent. The reduction applies to deliveries which started on April 18. On the combination passenger and freight locomotive lead unit of 1,500 hp. the reduction in base price amounts to $8,200; on the booster unit, $7,500, and on the 1,000-hp. switcher, $5,000. The base price of a 6,000-hp. four-unit freight locomotive is reduced $31,400. Price revisions on new models, designated as E-8 for the high-speed passenger locomotive of 2,250-hp. per unit and GP-7 for the general purpose road-switching type of 1,500 hp., are being deferred until a more accurate appraisal of costs can be made. The deferment applies also to the streamliner series of high-speed passenger locomotives and in the branch-line series of 1,500-hp. road switchers in which basic changes are being made.

◆

AMERICAN BRAKE SHOE COMPANY. The American Brake Shoe Company has expanded its sales activities in Cleveland, Ohio, by adding sales activities for the National Bearing division to its sales offices at 915 Midland building. *L. E. Hoyer* and *J. Robert Lottes*, National Bearing sales representatives, formerly at the Meadville, Pa., plant, will join representatives of the company's Brake Shoe & Castings, Southern Wheel, and Ramapo Ajax divisions in the enlarged office. Their activities will be under the direction of *James J. Nelson*, eastern sales manager for National Bearing.

Augustus H. Elliot, vice-president of the Southern Wheel division has retired after 40 years of service with American Brake Shoe. Mr. Elliot worked in various sales and engineering capacities in Philadelphia, Pa., and New York, for nearly 18 years. Since 1927 he has been a vice-president of the Southern Wheel division and has had charge of engineering and operation for many years. He established the company's Wheel Inspection department, which later was taken over by the Association of Manufacturers of Chilled Car Wheels. He also led in the development of the present chilled freight-car wheel.

◆

AMERICAN HOIST & DERRICK CO.—*Stanley M. Hunter*, vice-president of sales, American Hoist & Derrick Co., St. Paul, Minn., has been elected to the position of executive vice-president.

Mr. Hunter is a graduate of Albion College, Albion, Mich. He began his business career as an apprentice with the Novo Engine Company in 1919 and served as sales manager with that firm from 1925 to 1936, when he joined the sales department of American Hoist. He has been vice-president of sales and a director since 1945.

◆

EUTECTIC WELDING ALLOYS CORPORATION.—A "CutTrode," a cutting electrode of the Eutectic Welding Alloys Corpora-

Enroll Now!

NEW ELECTRO-MOTIVE PURCHASES AND STORES SCHOOL

TO ASSIST customer railroads to order, stock and handle Diesel parts more efficiently and economically, a new five-day course for your Purchases and Stores personnel has been added to the educational program offered by our Diesel Locomotive Training Center.

Those attending will be thoroughly schooled in the most modern methods of parts supply. They will be given a complete understanding of the functions of the locomotive and its component parts, followed by instruction in better organization of parts handling.

This will include discussions and demonstrations on the newest methods of parts procurement, warehousing, packaging, order processing and shipping conducted by our people in charge of these operations. Facilities of our Repair Department for reconditioning and repair of locomotives and components will be shown in detail.

This training program is open to all of our customers without charge. Railroad management is invited to make the course available to as many of its people as possible. Application for attendance should be directed through official railroad channels to Educational Director, Locomotive Training Center, Electro-Motive Division, General Motors Corporation, La Grange, Illinois.

Since its start in 1938 the Diesel Locomotive Training Center at La Grange has given instruction to more than 4,500 railroad supervisors. In addition, 53,000 people have received training in our School Car classes.

This continuous program of education is just one of the many *plus* values that go with your purchase of General Motors locomotives and genuine Electro-Motive parts.

CLASS SCHEDULE FOR 1949

Classes are conducted Monday through Friday on the following dates:

May 2—May 6	Aug. 29—Sept. 2
May 16—May 20	Sept. 19—Sept. 23
June 13—June 17	Oct. 3—Oct. 7
June 27—July 1	Oct. 17—Oct. 21
July 18—July 22	Oct. 31—Nov. 4
Aug. 1—Aug. 5	Nov. 14—Nov. 18
Aug. 15—Aug. 19	Dec. 5—Dec. 9

ELECTRO-MOTIVE

GENERAL MOTORS LOCOMOTIVES

DIVISION OF GENERAL MOTORS LA GRANGE, ILL.

Home of the Diesel Locomotive

Safeguard

Rolling Stock, Bridges, Tanks, Towers Metal Buildings, Signal Equipment and Other Properties Against COSTLY RUST!

Nothing equals Rust-Oleum —*the proved rust preventive* —for the lasting protection of metal—especially in closed or inaccessible areas where condensation due to temperature changes breeds rust.

RUST-OLEUM

Stops Rust!

- Rust-Oleum cuts preparation time. No sandblasting or chemical cleaners are necessary.
- Rust-Oleum outlasts ordinary materials two to ten times depending on conditions.
- Easy to use — Rust-Oleum assures lasting protection that resists rust-producing conditions.
- Apply by brush, dip or spray . . . in less time. Also available in small container sizes for economical distribution and field use.

Day and night—twenty-four hours a day—rust attacks railroad properties. Stop its deadly ravages by providing Rust-Oleum protection. Rust-Oleum coats metal with a tough, pliable moistureproof film that lasts years longer. *It's the proved answer to many rust problems.*

Rust-Oleum can be applied effectively and economically on all metal surfaces now in service—even where rust has already started. Merely wire-brush to remove scale and loose rust. Rust-Oleum merges the remaining rust into a rust-resisting, durable coating that defies time and the elements.

Save time and labor. Avoid frequent and costly replacements. Protect your properties with Rust-Oleum. Specify Rust-Oleum on new equipment, for re-building jobs . . . and for maintenance.

Get the facts now! Write for catalog containing complete information and recommended applications. Tell us your specific rust problems and we will gladly send you definite suggestions for Rust-Oleum applications.

RUST-OLEUM Corporation

2419 Oakton Street Evanston, Illinois

tion, New York, was used to cut a steel ribbon at ceremonies opening the company's No. 2 plant at Flushing, N. Y., early this month. This new plant occupies approximately 100,000 sq. ft. and houses a foundry, metal rolling and drawing plant, several large extrusion presses for producing coated electrodes, alloy cutting facilities, a complete gas welding division and special control and research laboratories.

◆

BAY STATE SPRAY EQUIPMENT COMPANY.—*J. J. Lynch,* for many years a sales engineer with the Binks Manufacturing Company, has organized the Bay State Spray Equipment Company, with offices and warehouses in Springfield, Mass., and Boston. Mr. Lynch will be in charge of all sales and service throughout New England.

◆

OHIO BRASS COMPANY. *Louis J. Ott,* advertising manager of the Ohio Brass Company, Mansfield, Ohio, has been appointed general sales manager.

Mr. Ott is a graduate of Amherst

Louis J. Ott

college. He began his business career in the advertising department of Ohio Brass in 1928 and has been advertising manager since 1935. During World War II he handled the company's relations with the War Production Board.

◆

GENERAL ELECTRIC COMPANY. *J. U. Neill* has been appointed manager of the parts division of the locomotive and car equipment divisions of the General Electric Company. *W. E. Lynch* has been appointed district manager of the transportation division in the central district of G. E., to succeed *F. W. Peters,* who has retired.

Mr. Neill has been with the company for more than 22 years and has been engaged in the design, application, sale and servicing of electric transportation equipment. He was assistant manager of the parts division prior to his recent promotion.

Mr. Lynch, a graduate of the University of Illinois, joined G. E. in 1926. He entered the transportation field in 1928 and has since been occupied with application and design of electric propulsion for all types of motive power. In 1931 he was assigned to the heavy-traction equipment field, where he

ENGINE-TENDER CONNECTIONS
with FRANKLIN SLEEVE JOINTS

Go longer without leaking ...Cost less to repair

THIS IS THE GASKET: The gasket of any joint is the heart of your maintenance problem. The Franklin gasket is rectangular in section, circular in form, and packs against flat surfaces. Its cost is only a fraction of gaskets used in other joints. It wears slowly and evenly, top and bottom, with wear automatically taken up by the spring in the joint. Many roads have found average life to be a year or more.

THIS IS THE JOINT: It is a double sleeve joint, with widely spaced bearings. The sleeve will not tilt or rock in the body — it will normally last for years. You cannot bind the joint by tightening the nut; flow area never changes regardless of angle of turn.

THIS IS THE CONNECTION: It is made up of three sleeve joints plus necessary pipe. Vertical drop between joint centers can be as little as 9 inches, and still give complete flexibility with only three joints — a distinct advantage in close quarters.

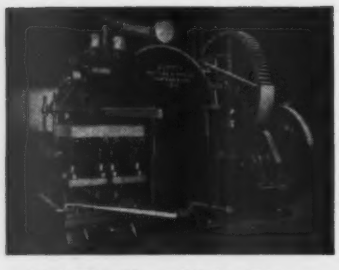
Cut costs of engine-tender connection maintenance with the Franklin Sleeve Joint. Available for air, steam or oil — in sizes from ½" to 2½".

FRANKLIN RAILWAY SUPPLY COMPANY

A CORPORATION

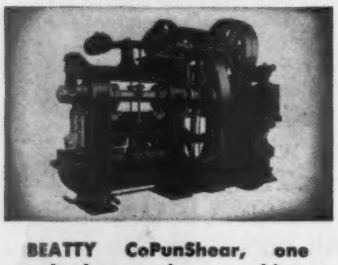
NEW YORK • CHICAGO • MONTREAL

STEAM DISTRIBUTION SYSTEM • BOOSTER • RADIAL BUFFER • COMPENSATOR AND SNUBBER • POWER REVERSE GEARS
AUTOMATIC FIRE DOORS • DRIVING BOX LUBRICATORS • STEAM GRATE SHAKERS • FLEXIBLE JOINTS • CAR CONNECTION



BEATTY No. 11-B Heavy Duty Punch widely used in railroad industry.

BEATTY combination Press Brake & Flanger does flanging, V-bending, pressing, forming, straightening.



BEATTY CoPunShear, one unit does coping, punching, shearing.

BEATTY Hydraulic Vertical Bulldozer for heavy forming and pressing.

BEATTY Horizontal Hydraulic Bulldozer for heavy forming, flanging, bending.

we're WISE
TO A LOT OF
PRODUCTION PROBLEMS

BEATTY-*engineered* heavy metal working equipment is on the job in hundreds of important plants, doing a wide variety of jobs. Yet, each machine is individually engineered to do its specific task better, faster, at less cost. This wide range of experience is your assurance of expert counsel, advanced engineering, finest quality construction. There's a better way to handle any heavy metal fabricating problem. Our job is to help you find that better way. If you have a problem, write us. We may have the answer.

HYDRAULIC PRESS METAL WORKING EQUIPMENT

BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA

worked on the Pennsylvania's electrification from New York to Washington, D. C. He has been active in the application of Diesel-electric power for switching and main-line service since 1939, and was appointed manager of the railway rolling-stock division at Erie, Pa., in 1941. He was transferred to Chicago in 1945.

Mr. Peters joined G. E. in July, 1913, in the test department. Later, he entered the railway equipment engineering division, from which he transferred to the railway engineering (now transportation) division.

◆

BRODERICK & BASCOM ROPE CO.—*F. Zimmerman*, vice-president of the Broderick & Bascom Rope Co., St. Louis, Mo., who has been in charge of sales, has assumed the new title of director of sales. *J. J. Sieber*, formerly chief product engineer, has been appointed sales manager.

◆

ACME STEEL COMPANY. *W. S. Huss*, who has been associated with the Acme Steel Company for the past 30 years, has been appointed sales manager of the firm's southern division, with headquarters at Atlanta, Ga. He succeeds *F. H. Webb*, who has retired.

◆

E. A. LUNDY COMPANY.—The E. A. Lundy Company, New York, is being operated by *B. S. Williams*, vice-president, since the death of E. A. Lundy, president, reported elsewhere in this issue. Mr. Williams has been with the company since 1935.

Obituary

E. J. DREWYOUR, of the Superheater Company, died on March 6, in Detroit, Mich. Mr. Drewyour was born on May 9, 1889. He was employed by the Michigan Central for many years before joining Superheater in June, 1923, as a service representative. He recently was appointed inspector for the company at the Lima, Ohio, plant of the Lima-Hamilton Corporation.

◆

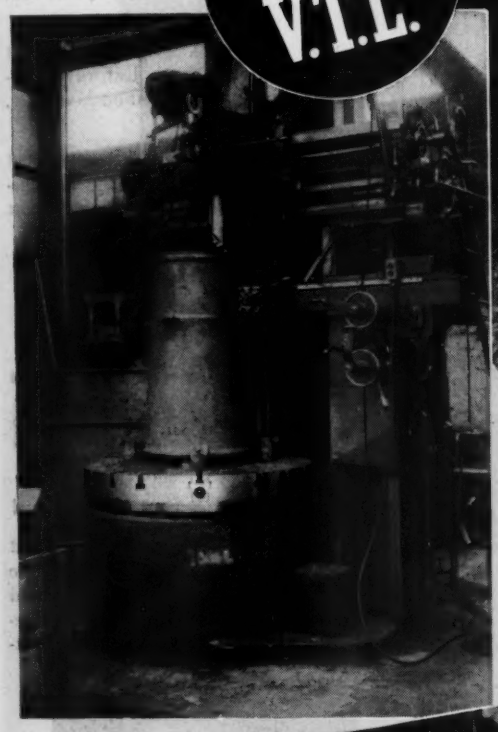
E. A. LUNDY, president of the E. A. Lundy Company, New York, died on

E. A. Lundy

April 1. Mr. Lundy was 55 years old. Before he organized the Lundy Company

BIG SAVINGS...

Bullard Cut Master V.T.L.



Small photographs show Bullards machining locomotive stack also boring and facing gear for Lidgerwood tire cutting machine.

On Miscellaneous Jobs, Too

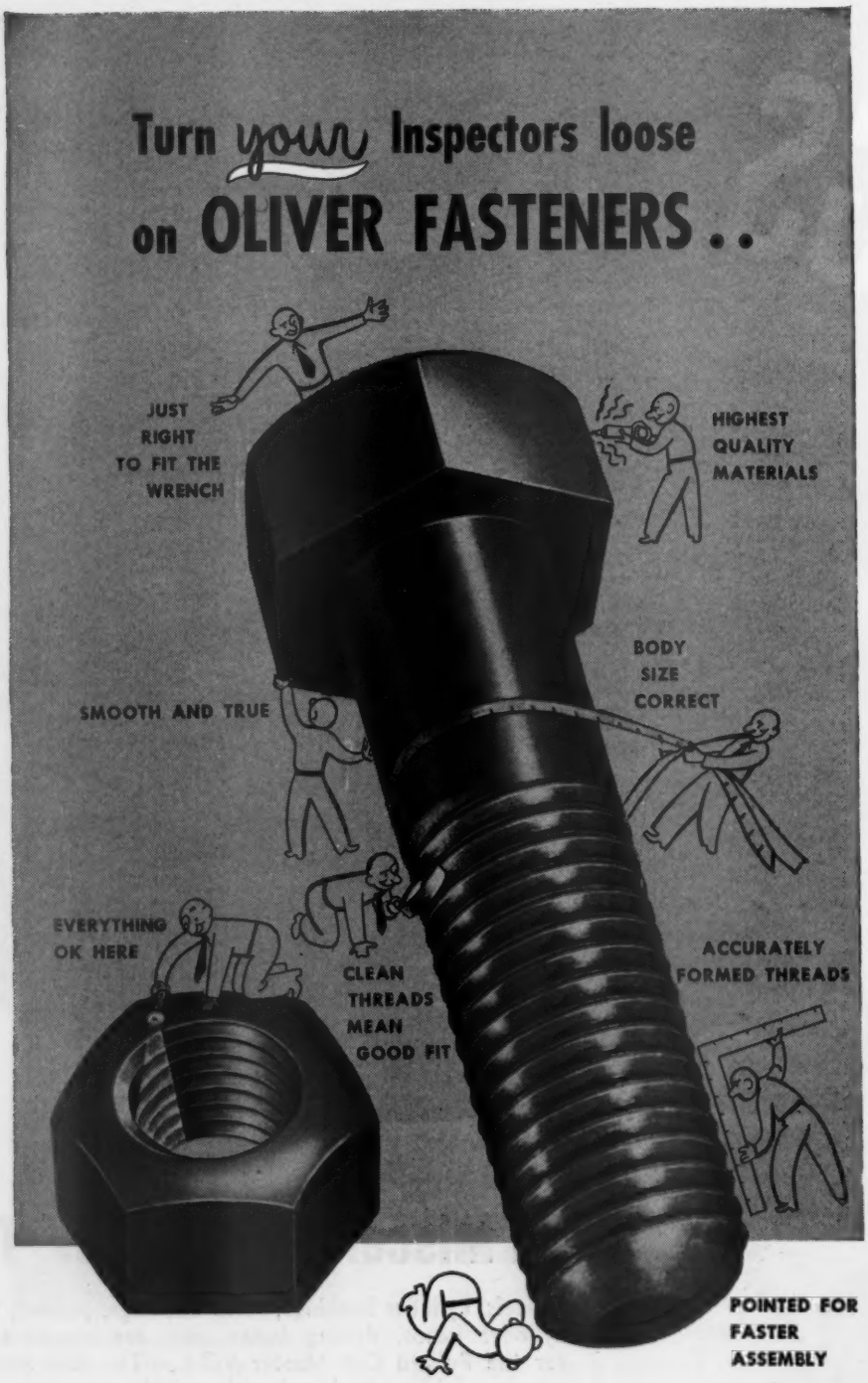
Wheels, cylinder bushings, valve bushings, pistons, rings, cylinder heads, driving boxes, etc. are standard jobs for the Bullard Cut Master V.T.L. The Cut Master's massive rigidity combined with a wide range of speeds and feeds can handle these jobs with big savings, uncompromised accuracy and to the acme of railroad requirements.

But as every shop foreman knows, various miscellaneous jobs do come up every so often and as a rule they are marked "RUSH" — so they are headed for the versatile BULLARDS.

Shop foremen know from long experience that Bullards will do a quick and accurate job on these emergency jobs so that repair parts can be rushed back into service to keep much needed equipment in operation with the least "time-out" for repairs.

Bullard Cut Masters can be had in six different sizes, 30", 36", 42", 54", 64", 74", with choice of six different head combinations on the four larger sizes.

THE BULLARD COMPANY BRIDGEPORT 2, CONNECTICUT



OLIVER Fasteners meet your most rigid specifications. Made under modern manufacturing conditions by one of the oldest firms in the industry, Oliver combines experience with skill to produce bolts, nuts, rivets and cap screws of highest quality.

For guaranteed satisfaction, specify OLIVER!

OLIVER
IRON AND STEEL
Corporation
South Tenth and Muriel Sts. · Pittsburgh 3, Pa.

in 1924, Mr. Lundy was associated with the Atlantic Coast Line from 1912 to 1916; the Long Island from 1916 to 1918; the Union Switch & Signal Co. from 1918 to 1920; and was business manager of Railway Electrical Engineer and Railway Signaling, publications of the Simmons-Boardman Publishing Corporation, from 1920 to 1924.

◆

CHARLES L. GALLOWAY, retired representative of the Hunt-Spiller Manufacturing Corporation, died on March 9.

◆

ARTHUR PURNELL, district sales manager of the Youngstown Sheet & Tube Co. at Chicago, died at his home in Evanston, Ill., on March 31.

◆

CLIFTON SLUSSER, vice-president of the Goodyear Tire & Rubber Co., since 1926, died on March 25. He was 56 years old.

◆

THOMAS W. DELANTY, vice-president and director of the Apex Railway Products Company, Chicago, died on March 26.

◆

CHARLES H. LONGFIELD, vice-president and general sales manager of the Youngstown Sheet & Tube Co., died of a heart attack on March 7.

PERSONAL MENTION

General

E. P. GANGEWERE, whose appointment as assistant general manager of the Reading at Reading, Pa., was reported in the April issue, was born at Bethlehem, Pa., on November 17, 1900, and at-

E. P. Gangewere

tended high school at Chattanooga, Tenn. During 1917 and 1918 he was an apprentice in the machine shop of the Wheland Machine Company at Chattanooga. He later attended Lehigh University, receiving the degree of mechanical engineer in 1922. Mr. Gangewere entered the service of the Reading in July, 1922, as a special

AMP

Plasti-Bond

Trade Mark

SOLDERLESS TERMINALS

TERMINALS AND TOOLING DESIGNED FOR ADDITIONAL RAILROAD SECURITY

Serrated terminal barrel.
Thin copper sleeve, for stronger crimp.
Plastic insulation bonded to the thin copper sleeve extends for insulation support.

AMP Certi-Crimp HAND TOOLS

Certi-Crimp hand tools feature a ratchet device which will not permit the tool to open, once the crimping cycle has started, until the operation is complete. . . . EACH TOOL IS ITS OWN INSPECTOR—operator fatigue and carelessness are eliminated!

For larger production AMP PNEUMATIC HAND TOOLS are available. Once the trigger is pulled a complete crimping cycle is accomplished.

AMP Plasti-Bond Solderless Terminals are designed especially for Railroad use! The terminal is PRE-INSULATED, having plastic insulation BONDED to a copper sleeve—cuts final installation time and costs!

In addition this inner copper sleeve is made *long enough* for maximum mechanical strength when crimped, but *short enough* to avoid causing a dangerous "short circuit". Experience has shown that "shorts" sometimes occur if faulty stud-block installation causes a break in the plastic sheath of a terminal. Plasti-Bond has no metal to be thus exposed underneath the insulation support. AMP has made another important step toward eliminating the dangers of human error!

AMP Plasti-Bond terminals are strong and durable with sturdy "hold fast" crimp. No chance for "shorts"!

AMP

AIRCRAFT-MARINE PRODUCTS Inc.

1314 N. FOURTH STREET, HARRISBURG, PA.

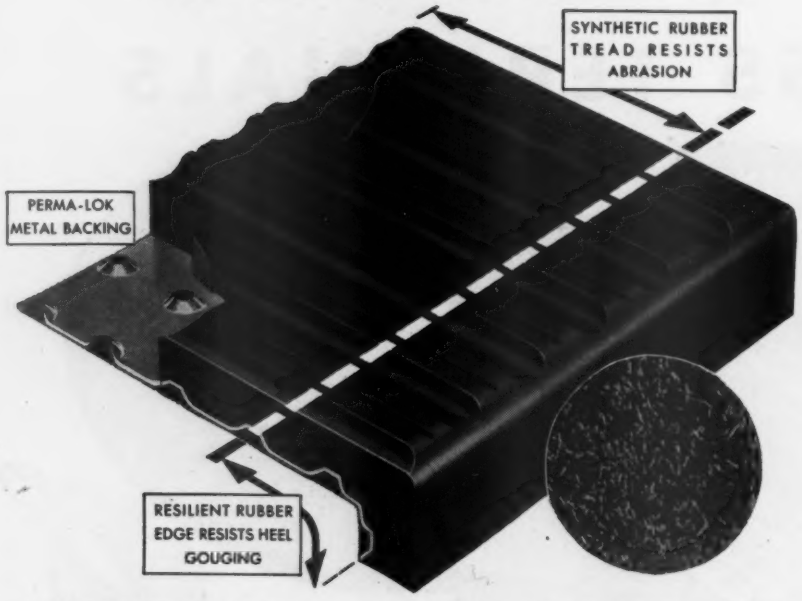
Sole Canadian representative:

F. MANLEY & SONS LTD., Toronto, Ont., Canada

RUB-BUB*

RAILROAD SAFETY FLOORING

Outlasts steel! Reduces pay accidents!
Used by 7 Class 1 roads!



TWO-ZONE CONSTRUCTION is an exclusive feature of Rub-Bub Heavy-Duty Safety Step Plate. It increases flooring life, adds an extra margin of safety. Microphotograph shows dense, fibrous texture of Rub-Bub compound that's never slippery *wet or dry.*

CAR analyses show that step plates require special design to withstand two distinct types of wear. First, lip and edge should resist rolling weight of passengers and sharp, gouging action of heels. Second, step tread should resist the combined abrasive action of cinders, dirt and shoe soles.

Unique two-zone construction of RUB-BUB Heavy-Duty Safety Step Plate solves both problems. For resiliency, RUB-BUB compound in lip and edge contains a high percentage of *live* rubber. For extra abrasion resistance, the tread is a full 5/16 inch thickness of RUB-BUB *synthetic* rubber compound. Both compounds are molded into one integral plate, double-bonded mechanically and chemically to the Perma-Lok metal backing. *The possibility of broken step edges is completely eliminated.*

RUB-BUB step plate is as safe after years of service as the day installed. Exclusive Dri-Foot rib design and toothy texture of RUB-BUB compound are never slippery *wet or dry.* Wide grooves through step nose drain water off *faster . . .* squeegee ribs grip shoe soles *tighter.* Natural resiliency of live rubber edge *helps to prevent shattered shinbone accidents.*

Specify RUB-BUB Heavy-Duty Safety Step Plate in combination with RUB-BUB vestibule plate, aisle tread and underseat flooring for safety . . . long life . . . appearance. Write today for RUB-BUB samples—*the big value in railroad flooring.*

RUB-BUB
Transportation Products

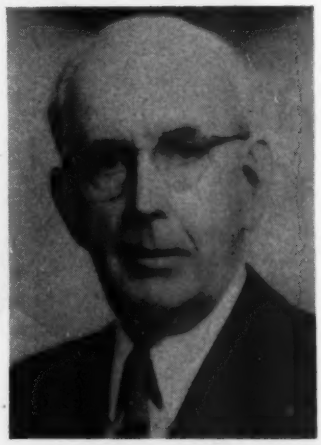
SAMUEL MOORE & CO. MANTUA, OHIO

IN CANADA | RAILWAY & POWER ENG. CORP.
Montreal • Hamilton • Windsor
Toronto • North Bay • Winnipeg
Vancouver • Noranda • New Glasgow

*T. M. REG. U. S. PAT. OFF. A-2055

apprentice on the staff of the assistant superintendent motive power, subsequently becoming motive-power inspector. In 1925 he was promoted to the position of mechanical supervisor and from 1927 to 1933 served successively as enginehouse foreman at Saucon Creek and Bethlehem, and as assistant master mechanic at Philadelphia, Pa. In 1933 he was appointed assistant superintendent of the Reading locomotive shop; on January 1, 1939, assistant superintendent of motive power and rolling equipment, and in January, 1942, superintendent of motive power and rolling equipment.

WILLIAM J. O'NEILL, superintendent of motive power of the Western Pacific, with headquarters at Sacramento, Calif., has retired after more than 54 years of service. Mr. O'Neill began his railroad career in 1893, at the age of 16, as a machinist apprentice in the employ of the Union Pacific and later became erecting foreman at Cheyenne, Wyo. He subsequently served with the Southern Pacific at Ogden, Utah, and as division foreman on the narrow gage at Mina, Nev. After working as machinist on several other roads, he became enginehouse foreman of the Chicago, Rock Island & Pacific at Herington, Kan., in 1907 and later served as master mechanic successively at El Dorado, Ark., Little Rock, Chickasha, Okla., and Shawnee. In 1915 he was appointed mechanical superintendent, second district, of the Rock Island, and in 1923 he became general mechanical superintendent of the Denver & Rio Grande Western. Mr. O'Neill left the Rio Grande in June, 1936, to become superintendent of motive power of the Western Pacific at Sacramento.



William J. O'Neill

ELBERT E. GLEASON, mechanical engineer of the Western Pacific at Sacramento, Calif., has been appointed superintendent of motive power at Sacramento. Mr. Gleason was born on October 17, 1889, at Marysville, Calif. He completed a course in mechanical engineering at Polytechnic College of Engineering, Oakland, Calif., in 1911. He then became enginehouse clerk for the Western Pacific at Oakland and in 1913 was transferred to the Sacramento shops, where he held various positions until 1916, when

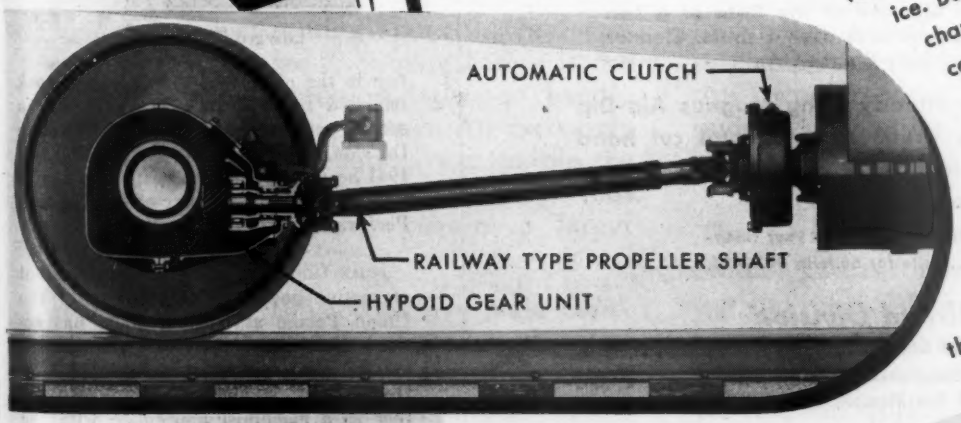
KEY FEATURE No. 14

45 YEARS OF Spicer SERVICE

LOW COST PER MILE ASSURES LONG RUN ECONOMY

Because the installation cost of Spicer Railway Generator Drives is low . . . because there is practically no maintenance necessary . . . because these famous generator drives actually last longer, their cost-per-mile is exceptionally low—which is the only way to adequately evaluate the long run economy of railway equipment!

Spicer Railway Generator Drives have been designed with a minimum number of parts. All wearing parts are constantly bathed in oil; consequently, they require very little inspection, maintenance or repair. Neither is there any cost involved for fuel, handling of fuel containers, or for replacement of belts or chains. Nor is there any cost involved for ice or the handling of ice. Batteries are kept fully charged with little, if any, cost for recharging.



There are more than 5,000 Spicer Generator Drives in operation on 50 different railroads. Write for full information giving all the advantages available to your railroad with the Spicer Positive Generator Drive.

45 YEARS OF Spicer SERVICE

Positive Generator Drive

Manufactured, Sold and Serviced by **SPICER MANUFACTURING**

Division of Dana Corporation • TOLEDO 1, OHIO

Mechanical Cleaning Saves Costly Labor for 9 Major Railroads

You can no longer afford to use ordinary soak tanks for your parts cleaning. You can cut cleaning time, labor and over-all costs with Magnus Aja-Dip Cleaning Machines on diesel and steam parts, air filters, compressors, signal elements, electrical equipment, etc. Here's the story on four railroad installations:

1. **Diesel Parts Cleaned in 1/4 the Time** formerly required in still tanks, using solvents. Magnus 755 in the Aja-Dip Machine also eliminates hand work.
2. **Steam Engine Parts Cleaned in 1/3 the Time** of steam gun cleaning. Magnus 92SM in the Aja-Dip Machine also gives a 10% increase in volume of cleaned parts.
3. **Steam Engine Parts Cleaned in 45 Minutes** where boil-out vat took 8 hours. No elbow grease needed. Magnus Heavy Duty Cleaner is used.
4. **Steam Engine Parts Cleaned at the Rate of a Ton per Shift** where still tank took over 4 shifts. Cleaner used is Magnus Heavy Duty Cleaner.

Nine major roads are already using Magnus Aja-Dip Cleaning Machines to speed cleaning and cut hand work. There's a size to handle any capacity needed from 100 to 2,000 lbs. of load.

For the mechanical approach to your cleaning problems... write for Bulletin 407-AST.

Railroad Division

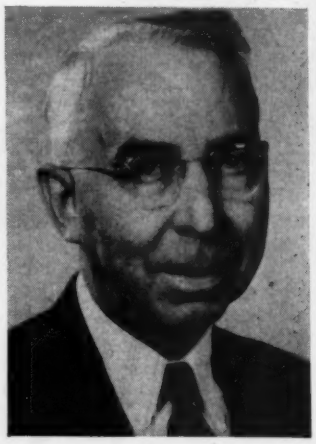
MAGNUS CHEMICAL COMPANY • 77 South Ave., Garwood, N. J.

In Canada—Magnus Chemicals, Ltd.
4040 Rue Masson, Montreal 36, Que.

MAGNUS CLEANERS
AND
CLEANING EQUIPMENT

Representatives in all principal cities

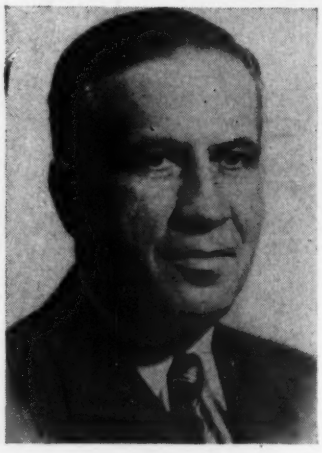
he became chief draftsman. In 1923 he was appointed mechanical engineer; in 1928, assistant to superintendent of mo-



Elbert E. Gleason

tive power; in 1939, master mechanic, and in 1941, mechanical engineer at Sacramento.

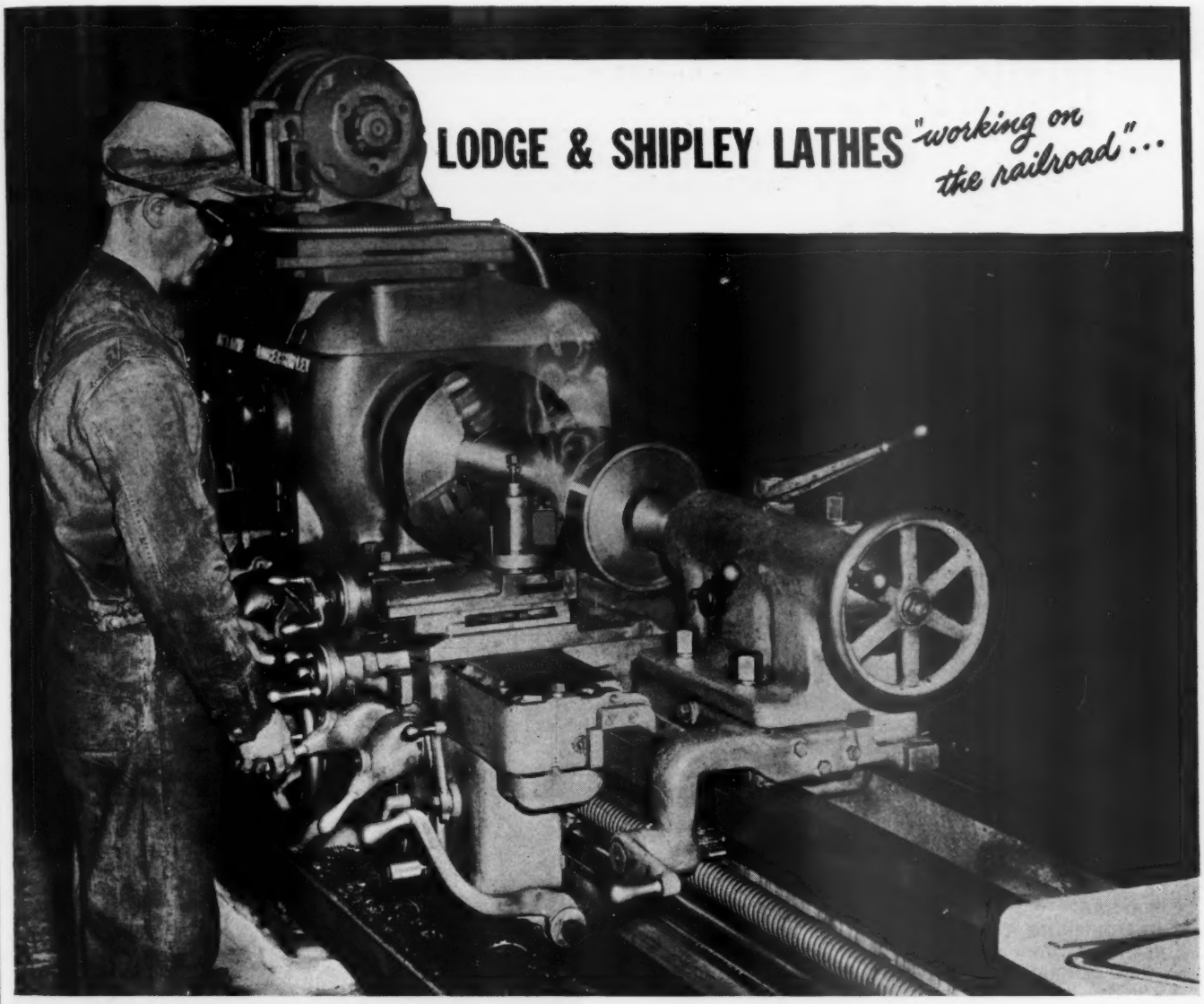
EDWARD T. CUYLER, assistant to the superintendent of motive power of the Western Pacific at Sacramento, Calif., has been appointed assistant superintendent of motive power. Mr. Cuyler studied engineering at Iowa University and, after leaving college, became a special appren-



Edward T. Cuyler

tice in the employ of the Chicago, Rock Island & Pacific. In 1937 he became a service engineer for the Electro-Motive Division, General Motors Corporation. In 1941 he was appointed assistant to superintendent of motive power of the Western Pacific.

JOHN GOGERTY, general superintendent of motive power and machinery of the Union Pacific at Omaha, Neb., has retired after nearly 50 years of railroad service. Mr. Gogerty was born in 1884, at Decatur, Ill. He began his railroad career as a machinist apprentice with the Grand Trunk at Montreal, Que., and after completing his apprenticeship, was employed as machinist and enginehouse foreman by a number of railroads, including the Wabash, the Denver & Rio Grande Western, the Missouri Pacific and the Chicago, Rock Island & Pacific. In 1918 he joined the U. P. as an engine-

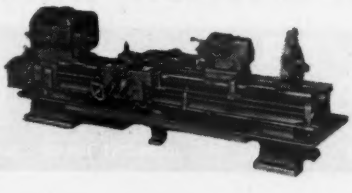


"MOST SATISFACTORY PERFORMANCE WITH FIRST CLASS ACCURACY ON TOUGHEST JOBS"

ONE quality that railroaders always mention when talking about the performance of their Lodge & Shipley Lathes is the ability of these precision lathes to handle "tough" turning assignments. An extremely rigid bed and ample horsepower enable the Lodge & Shipley Lathe to machine jobs which might ordinarily require a larger lathe.

In the photo, a 10" locomotive main crank pin is being turned on a Model "X" 18" Lodge & Shipley Engine Lathe in the shop of a noted Western Road. A special carbide tool is being used to cut the nickel-chrome-molybdenum steel at 88 r.p.m., .026 feed. On this and other widely varied railroad jobs, this owner reports "favorable" production, saving "off-the-line" time and maintenance costs.

The nation's leading roads use Lodge & Shipley Lathes for every type of manufacturing and repair. Write for Condensed Catalog which shows Engine, Tool Maker, Gap and Hollow Spindle Lathes . . . all ideally suited for railroad work.



THE Lodge & Shipley COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

Tempilstiks®

the amazing Crayons that tell temperatures

A simple method of controlling temperatures in:

- WELDING
- FLAME-CUTTING
- TEMPERING
- FORGING
- CASTING
- MOLDING
- DRAWING
- STRAIGHTENING
- HEAT-TREATING IN GENERAL

Also available in pellet and liquid form

It's this simple: Select the Tempilstik®· for the working temperature you want. Mark your workpiece with it. When the Tempilstik® mark melts, the specified temperature has been reached.

$2 each

gives up to 2000 readings

Available in these temperatures (°F)			
125	275	500	1100
138	288	550	1150
150	300	600	1200
163	313	650	1250
175	325	700	1300
188	338	750	1350
200	350	800	1400
213	363	850	1450
225	375	900	1500
238	388	950	1550
250	400	1000	1600
263	450	1050	

FREE —Tempil® "Basic Guide to Ferrous Metallurgy" — 16¼" by 21" plastic-laminated wall chart in color. Send for sample pellets, stating temperature of interest to you.

GORDON SERVICE

CLAUD S. GORDON CO.

Specialists for 33 Years in the Heat Treating and Temperature Control Field

Dept. 27 • 3000 South Wallace St., Chicago 16, Ill. • 7016 Euclid Avenue • Cleveland 3, Ohio

house foreman at Kansas City, Kan., and later served at Marysville, Kan., Salina, Junction City, Pocatello, Idaho, Laramie, Wyo., Green River, Cheyenne and Omaha. He advanced through the positions of district foreman, general foreman, master mechanic and superintendent of shops and, in 1936, became assistant general

John Gogerty

superintendent of motive power and machinery at Cheyenne. He was transferred to Pocatello in 1938 and to Omaha in 1939. Mr. Gogerty was appointed superintendent of motive power and machinery in April, 1940, and general superintendent of motive power and machinery in March, 1942.

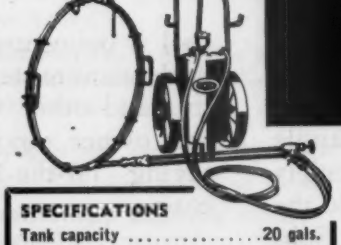
GEORGE C. WILMS, JR., mechanical engineer of the Central of New Jersey, has been appointed to the newly created post of assistant superintendent of motive power and rolling equipment, with headquarters as before at Elizabethport, N. J. Mr. Wilms was born at Baltimore, Md., 37 years ago. He served for several years with the Baltimore & Ohio as a draftsman, cost study engineer and motive-power inspector. He became mechanical engineer of the Jersey Central Lines on June 23, 1947.

O. J. PROTZ, whose retirement as superintendent of motive power and machinery for the Chicago, St. Paul, Minneapolis & Omaha (part of the Chicago & North Western System) at St. Paul, Minn., was reported in the April issue, was born at Winona, Minn., where he attended local public schools. He entered railroad service in 1903 as an apprentice with the North Western at Winona and later served as a machinist. In 1914, he became enginehouse foreman at Wyeville, Wis., and in 1917 was transferred to Huron, S. D. From 1920 to 1928, he served as general foreman successively at Belle Plaine, Iowa, Huron, S. D., Missouri Valley, Iowa, and

MAHR

ENGINEERS · DESIGNERS · MANUFACTURERS
ALL EQUIPMENT FOR METAL HEATING

LOCOMOTIVE TIRE HEATER



SPECIFICATIONS

Tank capacity	20 gals.
Operating air pressure	50-125 lbs.
Hose length	12½ ft.
Net weight	170 lbs.
Shipping weight	190 lbs.

GET FAST—EVEN—TIRE HEAT
WITH THE MAHR LOCOMOTIVE TIRE HEATER

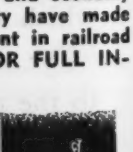
Positive uniformity of heat . . . ease and economy of operation . . . plus absolute safety have made MAHR tire heaters standard equipment in railroad shops all over the world. WRITE FOR FULL INFORMATION.

MAHR MANUFACTURING CO.

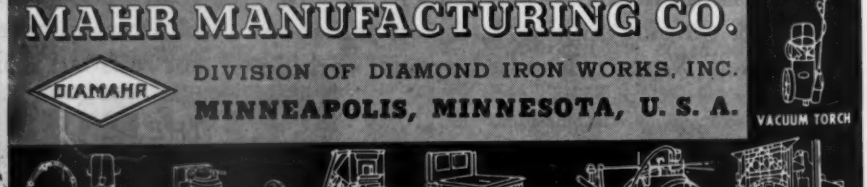
DIAMAHR

DIVISION OF DIAMOND IRON WORKS, INC.

MINNEAPOLIS, MINNESOTA, U. S. A.



VACUUM TORCH



LOCOMOTIVE TIRE HEATER · BURNER and BLOWER · RIVET FORGE · BLACKSMITH FORGE · LOCOMOTIVE FIRE OFF · FURNACES (ALL TYPES)

Andok B IN THIS TEST

HAS RUN OVER 270,000 MILES!

DURING TEST no additional grease has been added! ...inspection shows bearings in journal box are in excellent condition!... Esso **ANDOK B** has maintained its remarkable lubrication qualities even after the 270,000-mile record was set... and the road test is *still going on!*

FIELD TESTING like this on Esso Railroad Fuels and Lubricants is one of the practical follow-ups on the extensive research Esso constantly carries on in America's largest petroleum laboratories...making *doubly sure* you can *depend* on the railroad products that bear the Esso brand.

CALL IN our Esso Sales Engineer on *any* fuel or lubrication problem that we can help you solve.

The Sign of QUALITY **Esso** The Symbol of SERVICE

RAILROAD PRODUCTS

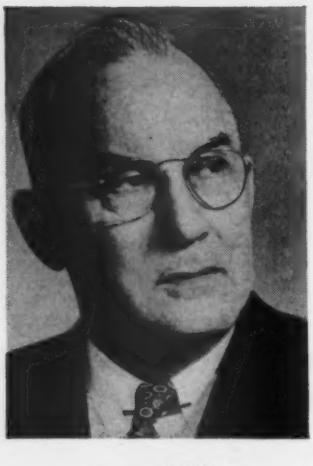
Chicago. He subsequently returned to Winona as master mechanic, and in 1929 became master mechanic at Escanaba, Mich. Mr. Protz was appointed assistant master mechanic of the North Western at Clinton, Iowa, in September, 1931; superintendent of locomotive and car shops at Chicago in September, 1939; superintendent of motive power at Chicago in October, 1943, and superintendent of motive power and machinery of the C. St. P. M. & O. at St. Paul in November, 1944.

E. A. STEVENS, assistant mechanical superintendent of the Pacific Electric at Los Angeles, Calif., since 1937, has been appointed superintendent of equipment.

FRED E. GEIBEL, superintendent of equipment for the Pacific Electric at Los Angeles, Calif., has retired after 27 years of service.

JOSEPH H. SMITH, chief draftsman of the Central of New Jersey, has been appointed mechanical engineer, with headquarters at Elizabethport, N. J.

HOWARD HILL, superintendent of shops of the Reading, has been appointed superintendent motive power and rolling equipment, with headquarters as before at Reading, Pa. Mr. Hill entered the service of the Reading as a machinist in 1914, at Philadelphia, Pa., and became assistant foreman in 1917; enginehouse foreman at Philadelphia on January 1, 1933; assistant master mechanic on September 1, 1936; master mechanic of the



Howard Hill

Philadelphia division on July 1, 1938; assistant superintendent of motive power and rolling equipment at Reading in January, 1942, and superintendent of shops in 1944.

E. L. BROWNE, fuel engineer of the Illinois Central, has been appointed traveling engineer, with headquarters at Memphis, Tenn.

C. G. WILLIAMS, Diesel supervisor of the Chicago, Rock Island & Pacific, at Kansas City, Mo., has been appointed superintendent of automotive equipment, second district, with headquarters at Kansas City.

KENNETH J. KERLIN has been appointed fuel engineer of the Illinois Central, with headquarters at Fulton, Ky.

D. S. NEUHART, assistant general superintendent of motive power and machinery of the Union Pacific at Omaha, Neb., has been appointed general superintendent of motive power and machinery at Omaha.

A. R. SNYDER, mechanical superintendent of Diesel power of the Union Pacific at Salt Lake City, Utah, has been appointed assistant general superintendent of motive power and machinery, with headquarters at Omaha, Neb.

Diesel

RAY A. MYLIUS, has been promoted to the position of foreman of the Diesel-electric locomotive shop of the Erie at Marion, Ohio.

Master Mechanics And Road Foremen

G. R. WEAVER, master mechanic of the Williamsport division of the Pennsylvania at Renovo, Pa., has been transferred to the Eastern division, with headquarters at Pittsburgh.

W. H. FARRELL has been appointed chief road foreman of engines, Toledo-West and Western divisions, of the New York Central, with headquarters at Elkhart, Ind.

WALTER L. HUEBNER, day enginehouse foreman of the Atchison, Topeka & Santa Fe at Barstow, Calif., has been appointed master mechanic, with headquarters at Clovis, N. M.

THOMAS T. BLICKLE, master mechanic of the Atchison, Topeka & Santa Fe at Dodge City, Kan., has been transferred to the position of master mechanic at Chicago.

J. P. FRANCIS, assistant master mechanic of the Eastern division of the Pennsylvania at Pittsburgh, Pa., has been appointed master mechanic of the Williamsport division, with headquarters at Renovo, Pa.

C. G. MAHONEY, general foreman of the Elgin, Joliet & Eastern at Gary, Ind., has been appointed master mechanic at Gary.

ROBERT B. WHEELER, master mechanic of the Southern at Richmond, Va., has retired after 43 years of service with the road.

Shop and Enginehouse

P. O. LIKENS, general foreman, locomotive department, of the Clinchfield, has been appointed superintendent of shops, with headquarters as before at Erwin, Tenn.

JOHNSTON

RIVIT FORGES produce

PROPERLY HEATED RIVITS at a SAVING!

Save on oil, air, time and maintenance costs. Equipped with JOHNSTON NON-CLOGGING VACUUM Oil Burner — no oil valve, no small oil passages to clog — outstanding for its ability to hold the oil adjustment and operate steadily for long periods without attention.

Shown is wheel portable, high pressure model. Other portable and stationary types to fit your needs. Write for Bulletin R-801.

For SAFETY and DEPENDABILITY — specify JOHNSTON.

THE JOHNSTON LINE — SAFETY DEPENDABILITY

JOHNSTON MANUFACTURING CO.
2825 EAST HENNEPIN AVE.
MINNEAPOLIS 13, MINN.

ENGINEERS & MANUFACTURERS OF INDUSTRIAL HEATING EQUIPMENT